DraftPine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project

Silviculture Report

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1.0 Introduction

The Silvicultural Report addresses the processes that will move the current existing vegetative conditions to the desired vegetative conditions.This silvicultural report will describe proposed treatments and analyze effects to vegetative resource as it relates to late successional habitat, hazardous fuels and overall forest health. Indicators are used to quantify and compare the degree to which the proposed action, no action and additional action alternatives meet the purpose and need for action. This report will be filed in the Project File located at the Upper Lake Ranger District Office in Upper Lake, California.

2.0 Regulatory Framework

The Mendocino National Forest Land and Resource Management Plan (LRMP)[1] provides standards and guidelines for fuels reduction and habitat enhancement treatments. In addition, National Forest management is guided by various laws, regulations, and policies that provide the framework for all levels of planning. Guidance is provided in Regional Guides, and site-specific planning documents such as this report. Higher-level documents are incorporated by reference and can be obtained from Forest Service offices. Project-specific ,planning and environmental analysis applicable to silviculture on NFS lands in the Project area include, but are not limited to,the following:

Regulatory Acts:

- Section 106 of the National Historical Preservation Act of 1966
- The National Environmental Policy Act of 1969
- Clean Air Act (CAA) of 1970
- Section 7(a)(1) of the Endangered Species Act of 1973
- Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (asamended) and National Forest Management Act (NFMA) of 1976 (as amended): The Forest and Rangeland Renewable Resources Planning Act of 1974 as amended by the National Forest Management Act of 1976 states that "it is the policy of the Congress that all forested lands in the National Forest System shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans."

Forest Service Regulations:

- The Record of Decision (ROD) and Standards and Guidelines (S&Gs) for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA/USDI 1994)[2]
- Forest Service Manual FSM 2470: Forest Service Manual 2470 directs that silviculture examinations, treatment diagnosis, and detailed prescriptions be prepared for all forest treatments (USDA 2004b)[3]. Stand examinations have been completed in the project area. These common stand examinations have been used for diagnosis of stand treatment need and for modeling of treatment alternatives.
- Forest Service Manual FSM 3400: Forest Service Manual 3400 directs that it is the policy of the Forest Service to include forest health considerations in forest resource

management planning and decision making. Forest supervisors and district rangers have the responsibility to Ensure full consideration of forest health issues in resource management activities.

- The National Fire Plan (USDA and USDI 2000d)[4]: The National Fire Plan was recommended in a report to the President in September 2000 and subsequently adopted by the Forest Service in conjunction with other federal wildland management agencies and published in the Federal Register on November 9, 2000. The purpose of the plan is to:
  - Improve the resilience and sustainability of forests and grasslands at risk
  - Conserve priority watersheds, species, and biodiversity
  - Reduce wildland fire costs, losses and damages
  - Better ensure public and firefighter safety
- The Mendocino National Forest Land and Resource Management Plan of 1995 (includes Standards and Guidelines from the Northwest Forest Plan)
- Watershed Analysis report for the Upper Main Eel River Watershed, (May 1995)[5] and the Upper Lake Watershed Analysis (September 1999)[6].

State Regulations:

- Manage National Forest activities to maintain air quality at a level which meets or exceeds State and/or local government regulations.

2.1 Forest Plan Management Direction

National Forest management is guided by various laws, regulations, and policies that provide the framework for all levels of planning. The Mendocino National Forest Land and Resource Management Plan, (LRMP) (1995) provides the direction for management activities on the Mendocino National Forest. The plan identifies specific management area direction representing the desired future condition that management actions are designed to achieve. LRMP Management Direction includes Forest Goals, Standards and Guidelines, Management Prescriptions, Management Areas, and Supplemental Management Area Direction. Compliance with this direction is required for any action taken on the Mendocino National Forest.

Forest management direction is implemented through management prescriptions and adherence to LRMP standards and guidelines. “Management prescriptions provide the linkage between management direction and specific land areas, and they provide direction in addition to the Forest-wide standards and guidelines” (LRMP, p. IV-55). The LRMP Management Prescriptions for this project include RX 3 -- Chaparral Management,RX 4 – Minimal Management, RX 6 – Late-Successional Reserve, and RX 7 – Timber Modified.

2.1.1 RX 3--Chaparral Management

improves age class distribution and diversity, and also breaks up large continuous blocks of high fuel loadings, resulting in easier fire suppression and reduced threat of catastrophic wildfire” (LRMP, IV-58). “The The purpose of this prescription is to provide a rotational prescribed burning program or

other vegetation treatment technique to accomplish the chaparral forest goal. The Chaparral forest goal is to: "Bring suitable chaparral lands under management to capture potential range, wildlife, recreation, and watershed benefits and to reduce the risk of large costly wildfires" (LRMP, IV-2). "Chaparral management most significant change in the chaparral type on the Forest will be in the distribution of age classes…"(LRMP, IV-2). The LRMP predicts that through chaparral management "Age class diversity will increase as a result of Plan implementation…" (LRMP IV-2).

The management direction and associated standards and guidelines emphasis is to: "Locate and design prescribed burns using an interdisciplinary approach, to protect and conserve botanical diversity, viability of sensitive plant species and populations, wildlife habitat, watershed values, and other resource values as appropriate to specific project sites. (LRMP IV-58).

2.1.2 RX 4 – Minimal Management

This prescription is to be applied to riparian reserves. Treatment units contain 5093 acres associated with riparian reserves.

To achieve the Riparian and Aquatic Ecosystems forest goal, the LRMP has designated Riparian Reserves (RRs) to be managed under the Minimal Management prescription. The LRMP standards and guidelines establish appropriate conditions to allow timber harvest within Riparian Reserves. They are to: "Apply silvicultural practices for riparian reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain aquatic conservation strategy objectives" (LRMP, IV-35).

2.1.3 RX 6 - Late-Successional Reserves (LSR)

The purpose of this prescription is to provide for the viability of the northern spotted owl and other species dependent on older mature forested habitats, including, but not limited to, goshawk, marten and fisher.

Silvicultural systems proposed for Late-Successional Reserves have two principal objectives. (1) development of old-growth forest Characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and (2)prevention of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations. Small-scale disturbances by these agents are natural processes, and will be allowed to continue. (FSEIS ROD p. B-5)

In addition, MNF is party to a settlement agreement[1]. In the settlement agreement "Agencies estimated that 1.8 million acres of LSRs could benefit from thinning to enhance late successional conditions. Thinning one million of these acres could be accomplished with commercial timber harvest" (paragraph 2.11), "…thinning sales in the LSRs could produce approximately 4-6 billion board feet …"(paragraph 2.12). The settlement agreement directed the Forest Service to use our "…best efforts every year beginning in Fiscal Year 2005: (1) offer timber sales in an amount equal to the annual PSQ[2] …and (2) to offer thinning sales as described in paragraph 2.12…as long as such sales areconsistent with the ecological objectives of the NWFP." (Paragraph 3.2). The Treatment Prescription 3 –Ecological Fuel Reduction Treatment -- Commercial Thinning as described under the proposed action is planned to confirm to requirement of the settlement agreement direction.

2.1.4 RX 7 - Timber Modified

This prescription provides emphasis on timber production while providing for other resource objectives including visual quality, watershed, rare and endemic species, and wildlife. This prescription applies to treatment units 18, 29 and portions of 23 totaling 184 acres.

The Timber Modified prescription provides management of "capable, available, and suitable timberlands found outside of wilderness, wild & scenic rivers, backcountry areas, RNAs, and riparian reserves" (LRMP, IV-69). The objective for these lands is to manage with an "emphasis on timber production while providing for other resource objectives including visual quality, watershed, rare and endemic species, and wildlife." (LRMP, IV 69). Management Direction for suitable timberland under the Timber Modified management prescription calls for the regulation of "… all timber yields from suitable timber lands" and to "Intensively manage timber stands for control of competing vegetation, stocking control, etc." (LRMP, IV-70).

In addition, Congress establishes timber harvest targets for the Forest Service in annual appropriations, and individual national forests are assigned their portion of the targets based, in part, on the allowable sale quantity established in each forest's LRMP. The Mendocino National Forest's LRMP established an allowable sale quantity of 2.2 million cubic feet (14.8 million board feet) for the second decade (LRMP, IV-14). The Pine Mountain Project would contribute to the Mendocino National Forest's annual sale target in the year it is sold. Between fiscal years 2005 and 2010, the annual sale target has ranged from 1.0 to 2.1 million cubic feet[3].

[1] Settlement Agreement: American Forest Council et al. v. Clarke, Civil No. 94- 1031 TPJ 9D.D.C.), appeal pending No. 02-5024 (D.C.Cir.)

[2] PSQ = probable sale quantity = The agencies best estimate of the average amount of timber likely to be offered in the NWFP area over the succeeding decade. Paragraph 2.6

[3] Budget direction for fiscal years 2005 through 2009: FY 2005 = 1.75 MMCF; FY 2006 = 1.10 MMCF; FY 2007 = 0.98 MMCF; FY 2008 = 2.09 MMCF; FY 2009 = 1.89 MMCF; FY 2010 = 1.89 MMCF.

Fire and Fuels

In addition, to the management direction provided by the management prescriptions discuss above, the LRMP has established Forest Goals and standards and guides that pertain to fire and fuels management. The fire and fuels forest goal: "Maintain a cost effective detection, prevention, suppression, and fuels management program mix in support of other resource programs" (LRMP, IV-2).

In order to accomplish that goal, the LRMP emphasizes "fuel treatment efforts for fire hazard reduction purposes in the following areas:

Natural fuels:

- Continuous, mature brush stands of more than 150 acres adjacent to or within areas of urban interface, resource investments, or high fire hazards;
- Continuous, mature brush stands more than 25 years old;
- Continuous, mature brush stands with dead-to-live ratios greater than 35%.
- Forested areas with excessive accumulations of natural fuels.

Activity fuels:

a) In zones of urban interface or other high fire hazard areas;
b) Where treatment is necessary before initiating other multi-resource management projects, e.g., reforestation (LRMP IV-21).

2.2 Additional Data Sources

Data used in this analysis included:

- Property boundaries
- Treatment area boundaries
- Project area boundaries
- Historic Fire Activity
- Management Area boundaries

- California Regional Forester Forest Density Management Direction 2470/5150/3400, letter dated July 14, 2004. The letter gives direction to design thinning activities to "achieve the multiple objectives of increased resistance to damage from crown fires, reduced surface/ladder fuels, reduced insect damage, and inter-tree competition, and restoration of densities more characteristic of the past under the influence of natural fire regimes. The letter also included direction to design projects that will be "effective for longer timeframes" by designing thinning to ensure "that density does not exceed an upper limit (for example…60% of maximum stand density index)" and "that this level will not be reached again for at least 20 years after thinning."

- Watershed Analysis report for the Upper Main Stem Eel River Watershed Assessment, (May 1995) and the Upper Lake Watershed Analysis (September 1999).

  Guidance is contained in the Watershed Analysis report for the Upper Main Eel River Watershed. This report was developed around seven key issue identified for detailed analysis. Issue 1: Anadromous salmonid stocks are at risk of disappearing from the

Upper Main Eel watershed. Issue 2: Natural events and past management activities have modified riparian ecosystem function within the Upper Main Eel watershed. Issue 3: Concern exists over habitat distribution patterns and relative abundance of threatened, endangered, and special status (TE&S) animal and plant species in the Upper Main Eel watershed and their contribution toward species dispersal, viability and diversity. Issue 4: Concern exists that management activities and natural processes have encouraged development of plant communities in the Upper Main Eel watershed that may be more susceptible to large-scale disturbance events and may have reduced overall ecosystem health. The result is a landscape that is susceptible to severe large-scale fire disturbance and insect infestation events and has a reduced and endangered compliment of key disturbance-dependent seral vegetation types. Issue 5: The Upper Main Eel watershed has the potential for providing employment opportunities through resource management and restoration activities. Issue 6: Erosion in the Upper Main Eel watershed has affected the characteristics of many stream channels and impacted water quality in Lake Pillsbury and water for associated downstream uses. Issue 7: Recreation and Experiential Values.

The key issue driving this project is Issue 4. The project area is identified as an area where management activities and natural processes has encouraged development of plant communities that are more susceptible to large-scale disturbance events and has reduced overall ecosystem health. The project design and prescription activities incorporate measures to benefit or to offset impacts to the other issues.

- Lake County Wildfire Protection Plan (2009);
- Common Stand Examination (CSE) data measured during the period 2008-2011 these inventories are focused on units proposed for a commercial treatment. The inventories are intended to provide information on the conditions of the various seral stages across the landscape, as well as some unit-specific information. The units that are proposed only for understory fuel reduction treatments (underburning and/or sub-merchantable brush and tree removal only) were not inventoried and effects are based upon professional local experience with treatments in similar conditions.

- Site visits that have occurred from 2008 through 2016 to validate inventory data and vegetative conditions. Site visits have included representatives of the U.S. Fish and Wildlife Service and the National Fisheries Marine Service (of the National Oceanic and Atmospheric Administration [NOAA]) and interested members of the public. Site visits were conducted by Forest Service and consulting experts in the following areas: forestry, fire and fuels management, fisheries, forest pest management, hydrology, recreation, scenic management, silviculture and wildlife and fisheries.

3.0 Resource Indicators and Measures

Treatment effects on vegetation are analyzed using the following indictors and associated metrics to document how the proposed action and action alternative meet the purpose and need verses the no action alternative to achieve forest goal compliance.

Table 1: Resource indicators and measures for assessing effects

Table 1 **INDICATORS**	Alternative 1 No Action	Alternative 2 Treatment 3 (commercial)	Alternative 3 No New Temporary Road Construction	Alternative 4 Treatment 2 Applied to Riparian Reserves	Alternative 5 Treatment 2 Applied to Nesting Units
Number of Foraging Unit Acres Meeting USF&W BA/Acre Standard	1539	1539	1539	1539	N/A
Number of Foraging Unit Acres Meeting USF&W QMD/Acre Standard	816	1539	1539	333	N/A
Number of Foraging Unit Acres Meeting USF&W Tree/Acre ≥ 26" DBH Standard	1465	1465	1465	1465	N/A
Number of Foraging Unit Acres Meeting USF&W Percent Canopy Cover Standard	1539	1539	1539	1539	N/A
Number of Nesting Unit Acres Meeting USF&W BA/Acre Standard	59	59	59	59	59
Number of Nesting Unit Acres Meeting USF&W QMD/Acre Standard	20	59	59	10	59
Number of Nesting Unit Acres Meeting USF&W Tree/Acre ≥ 26" DBH Standard	59	59	59	59	59

Table 1 INDICATORS	Alternative 1 No Action	Alternative 2 Treatment 3 (commercial)	Alternative 3 No New Temporary Road Construction	Alternative 4 Treatment 2 Applied to Riparian Reserves	Alternative 5 Treatment 2 Applied to Nesting Units
Number of Nesting Unit Acres Meeting USF&W Percent Canopy Cover Standard	59	59	59	59	59
Number of Unit Acres where Stand Density Index = Extreme High Density.	1681	20	20	995	29
Number of Unit Acres where Stand Density Index = High Density.	21	232	232	30	30
Number of Unit Acres where Stand Density Index = Moderate Density.	0	1470	1470	862	0
Number of Acres Early Seral Stage	21	21	21	21	21
Number of Acres Mid Seral Stage	1014	0	0	686	0
Number of Acres Late Seral Stage	0	24	24	0	0
Number of Acres Mature Seral Stage	666	1656	1656	970	55
Number of Acres Early Successional Stage	21	21	21	21	21
Number of Acres Mid Successional Stage	1014	17	17	686	0
Number of Acres Late Successional Stage	666	1663	1663	260	55

Indicator selectionis based on the project area and treatment unit areas available existing data; data collected specific to the project area treatment units; forest wide assessments and field reviews. Indicator selection incorporates professional judgment and review of existing literature and material on the interactions of forest existing conditionsand desired condition as related to protection and enhancement of late-successional habitat.Indicators will be used to predict if desired conditions would be met following project implementation. The indicators incorporate stand structure and species composition, basal area, stand density; tree size, and canopy

cover.Indicators were also developed from the USF&G document titled “Regulatory and Scientific Basis for U.S. Fish and Wildlife Service Guidance for Evaluation of Take for Northern Spotted Owls on Private Timberlands in California’s Northern Interior Region” (USF&G 2008)[7] (USF&W Take Avoidance Analysis Interior) which contains stand metrics needed to avoid habitat impact which would lead to NSO take situation

Seral Stage Indicator: A **seral** community is an intermediate **stage** found in ecological succession in an ecosystem advancing towards its climax community. Seral stages for forested ecosystems have been classified within this report as Early, Mid, Late and Mature s based on the California Wildlife Habitat Relationship system.

Basal Area measurement indicator: Basal area is a measure of stand density or stocking. Basal area is the cross section area of a tree stem in square feet measured at breast height (4.5 feet above ground) and inclusive of bark. Stocking density is determined by the sum of the basal areas for all trees on a per-acre basis. Basal area was the determining variable used to model residual stand density and canopy cover levels. Basal area is a measurement used to describe stand stocking levels for wildlife habitat. Basal area is commonly used as a measure of canopy cover when describing overstory-understory relationships in forestecosystems. (Mitchell 1996) Basalarea is an indicator measure referred to by USF&W Take Avoidance Analysis Interior.

Tree Diameter Size Class Measurement Indicators:

1. **Quadratic Mean Diameter (QMD):** Quadratic Mean Diameter was chosen as an indicator because of its relationship to the healthy growth of trees and as a measure of diameter and bark thickness, which is related to damage from fire. Calculation to assess tree distribution changes, were performed to determine the (QMD). QMD is an expression of the diameter of the tree with the average basal area. Therefore, QMD gives greater weight to large trees. QMD may be equal to but is usually greater than the arithmetic mean (Curtis & Marshall 2000)[8]. QMD is also stable for modeling purposes, being better correlated to stand density and directly convertible to basal area. The Forest Vegetation Simulator (FVS) uses QMD in many equations. QMD is a stand attribute that is used to describe wildlife habitat. Refer to the wildlife specialist Biological Assessment/Biological Evaluation of Terrestrial Wildlife Species report for associated treatment effects. QMD is an indicator measure referred to by USF&W Take Avoidance Analysis Interior.
2. **Number of Trees per acre ≥26" DBH:** In addition, to calculating QMD, the retention quantity for trees greater than or equal to 26 inches DBH were determined. In response to direction documented by USF&W Take Avoidance Analysis Interior.

Canopy Cover Measurement Indicator: Canopy cover is the degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. Canopy cover relates to the ground area covered by a vertical projection of the canopy, and is expressed as a percent of ground area covered. Canopy cover is another stand attribute that is used to describe wildlife habitat and fuel hazard conditions. Canopy cover is an indicator measure referred to by USF&W Take Avoidance Analysis Interior.Refer to the

fuels specialist report and the wildlife specialist Biological Assessment/Biological Evaluation of Terrestrial Wildlife Species report for associated treatment effects.

Stand Density Index Measure Indicator: SDI is used as an indicator to assess stand conditions related to inter-tree competition and describe stand characteristics resulting from proposed treatments or no treatments. SDI is a widely used measure developed by Reineke in 1933 that expresses relative stand density in terms of the relationship of number of trees to stand quadratic mean diameter (Helms 1998)[9]. The relationship between the average size of individuals in populations experiencing density-related or suppression mortality has been shown to be exceedingly predictable for a number of herbaceous and tree species. In the ecological literature, the relationship is commonly referred to as the "self-thinning rule". This fundamental relationship, generally independent of stand age and site quality, provides an excellent basis from which to develop an understanding of the competitive interactions between individuals in a population (Long 1985)[10].

Number of trees per acre Measurement Indicator: Number of trees per acre is used as an indicator to assess stand conditions relative to pre-treatment conditions and post-treatment condition.

4.0 Affected Environment

4.1 Existing Condition

Existing Vegetation Types

The Pine Mountain Project area contains a variety of vegetation types. The California Wildlife Habitat Relationship system identified fourteen different vegetation types. These types are present in varying concentration from pure chaparral stands to a combination of chaparral – hardwood, conifer – hardwood, or mixed conifer associations. **Table 2 and 3**display the various vegetation type acreages in terms of California Wildlife Habitat Relationship vegetation types.

Table 2 Project Area CWHR* Forest Vegetation Types & Seral Stage

CWHR*TYPE CODE	Vegetation Type	Seral Stage Acres				
		Early	Mid	Late	Mature	Total Acres
BOP	Blue Oak-Foothill Pine		1			**1**
BOW	Blue Oak Woodland		7			**7**
COW	Coastal Oak Woodland	9	6			**15**
CPC	Closed-Cone Pine-Cypress	11	18			**29**
DFR	Douglas Fir	67	35	35	389	**526**
MHC	Montane Hardwood-Conifer	142	404	726		**1272**
MHW	Montane Hardwood	179	907	479		**1565**
PPN	Ponderosa Pine	214	28	92	87	**421**
SMC	Sierran Mixed Conifer	509	527	1947	2264	**5247**

	Grand Total	**1131**	**1933**	**3279**	**2740**	**9083**

*California Wildlife Habitat Relationship

Table 3 - Project Area CWHR* NON-Forest Vegetation Types & Seral Stage

CWHR*TYPE CODE	Vegetation Type	Seral Stage Acres				
		Seedling	Young	Mature	Decadent	Total Acres
AGS	Annual Grass					**127**
PGS	Perennial Grassland					3
CRC	Chamise-Redshank Chaparral				208	208
CPCH	Mixed Chaparral				740	740
MCP	Montane Chaparral				47	47
	Grand Total				**995**	**1125**

*California Wildlife Habitat Relationship

OVERVIEW

The Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project (Pine Mountain Project) environmental setting is situated in the southwest portion of the Upper Lake Ranger District Mendocino National Forest southwest of Lake Pillsbury in the Pine Mountain vicinity.The project emphasizes fuel reduction activities and habitat management for the protection and enhancement of late-successional species. The project area was chosen for treatment based on past fire and timber harvest historythat have contributed to the development of the existing conditions that pose a threat to late-successional habitat.

The project area is located within the southern portion *mid montane ecological zone* of the Klamath bioregion, an area of diverse conifer and woodland species. Historic vegetation community dynamics within the mid- to upper-montane zone are believed to have been influenced by a fire regimecharacterized by fairly frequent low and mixed severity fires that created an open understory mixed conifer forest habitat across the project landscape. (Skinner et al. 2006)[11]Historically fires have thinned out competing species, recycled nutrients into the soil, released and scarified seeds, and opens holes in the forest canopy for sunlight to enter. All of these are critical to forest health and natural cycles of growth and decomposition. Plant communities and ecosystems have evolved with and adapted to fire. This historic dynamic provided an ample supply of high quality habitat for many species including species that require late-successional habitat. Changes in vegetation dynamics caused by the alteration of the historic fire regime have caused a shift in tree density distribution and quality of habitat. The current existing condition tree density is impacting and lessoning late successional habitat quality including Northern Spotted Owl nesting and foraging as the number of large diameter trees has decreased in relationship to increasing number of small diameter trees.

The Projects existing vegetative condition is a result of combination of factors. These factors include Historic Vegetation Conditions, Historical Pre-Suppression Era Fires, Fire Suppression, Suppression Era Fires, Forest Health, Timber Harvest Activities, Weather Events and Climate Influence

Pine Mountain Project area, like many locations throughout the Mendocino National Forest, is especially vulnerable to wildfire, because it has lost much of the historic fire resilience due to overcrowding caused by fire suppression, and only minimal management activitiesemployed to control post harvesting regeneration response which began in the early 1950's and continued into the early 2000's timber harvest time period.

The outcome established existing condition that can be characterized by increased tree densities contributing to ladder fuel connectivity to the upper canopy levels; shading out large hardwood trees and small area hardwood patches, as well as; large and small diameter ponderosa pine trees.The overall effect impacts species diversity, contributes to a substantial increase in surface fuel loading and ladder fuel connectivity compared to historic diversity,surface and ladder fuel conditions. There are higher concentrations of live ladder fuels, greater amounts of dead standing trees and greater amounts of small diameter woody debris on the ground. In addition, when the large diameter pine trees fall out as individual orin clump concentrations, they take out some of the ladder fuel trees.The result is creating heavy surface fuel concentrations around the downed larger pine trees. As a result, the potential for the project area to burn at high severity (where most mature trees are killed) has increased dramatically. The crucial interaction is that wildfires under these conditions are larger; as well as, more intense, erratic and difficult to control. Firefighter safety, ecosystem sustainability and late-successional species populations are all compromised by these habitat developments which tend to produce uncharacteristic wildfire events.

Historic Vegetation Conditions

Plant Community Classification and Identification,

Plant communities associated with the Pine Mountain Project are classified according to structure type, (tree, shrub, or herbaceous) and dominance of taxa. A plant community is a recognizable and complex assemblage of plant species which interact with each other as well as with the elements of their environment and is distinct from adjacent assemblages. There are a number of common sub-classifications of plant communities these sub-classifications include, (forest, chaparral, riparian, and grassland, etc.), which are further divided into more specific classifications. These more specific classifications are referred to as vegetation types and are based on the dominant tree, shrub, or herb in that canopy. The name given to each is often the common name of the dominant and co-dominant taxa coupled with the sub-classification type. Examples of these within the Pine Mountain Project area are Sierra Mixed Conifer, Chamise-Redshank Chaparral, Closed-Cone Pine-Cypress (Knobcone Pine), and Annual or Perennial Grassland. Project area plant communities may occur as relatively obvious divisions between each other, or may overlap and have transition zones called ecotones that grade into one another. Ecotones may vary in size and species composition, containing elements of each of the bordering communities. Whatever characteristics specific ecotones may have, this report will identify vegetation type changes on the broader categorization, plant communities.

Reference Communities

The Reference Community for the Pine Mountain Project site is the plant community that existed at the time of European immigration and settlement. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site. This community was in dynamic equilibrium with its environment. It is the plant community that was able to avoid displacement by the suite of disturbances and disturbance patterns that naturally

occurred within the area occupied. Natural disturbances, such as drought, fire, animal and insect impacts, were inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the site that contribute to that dynamic equilibrium. Fluctuations in plant community structure and function caused by the effects of these natural disturbances establish the boundaries of dynamic equilibrium. They are accounted for as part of the range of characteristics for an Ecological Site. Plant communities that are subjected to abnormal disturbances; physical site deterioration; or protection from natural influences for long periods, such as fire exclusion, seldom typify the historic Reference Community. Such communities may exist in a steady state that is very different from the historic Reference Community.

The historic vegetative conditions within the Pine Mountain Planning Area consisted of relatively open forested stands of predominately large, Douglas-fir, ponderosa and sugar pine and hardwoods. Field data and observations indicate these trees varied in distribution from widely spaced individuals or multiple trees arranged in a clump like distribution that contributed to an overall open canopy (40 to 60%) stand structure on the flatter ridge top or upper slope areas to closely space tree distribution on the lower slopes to near watercourse areas.

Historical Pre-Suppression Era Fires

Before Euro-American settlement, relatively frequent fires strongly influenced the composition, structure, and dynamics of the Pine Mountain Project forest ecosystems (Taylor and Skinner, 2003; Skinner and Chang 1996)[12]. These fires, mostly low to moderate in severity, caused changes by damaging or killing plants and setting the stage for regeneration and vegetation succession. They maintained surfacefuels at fairly low levels, and in most areas kept forest understories relatively free of trees and other vegetation. In addition, fires influenced many processes in the soil and forest floor, including the organisms therein, by consuming organic matter, affecting nutrient cycling, and inducing other thermal and chemical changes (Agee 1993; Chang 1996)[13]
. These fire effects in turn resulted in a wide array of effects on other ecosystem components and processes, including wildlife communities and watershed properties. Because fire influenced the dynamics of nearly all ecological processes, reduction of the fire influence through the 20th century and into the 21st century, fire suppression efforts has had widespread ecosystem effects.

The dramatic reduction in area burned has led to substantial increases in the quantity and changes in arrangement of live and dead fuels. While data from early 20th century is not available for the Pine Mountain Project, the Late Successional Reserve Assessment does provide information based on comparisons with early conditions characteristics of conifer stands within the Thomes Creek watershed (Buttermilk LSR) pre-fire suppression (1913) vs. post-fire suppression (1991) (LSRA, pgs. 14-15)[14]. Refer to Table 4 below.

Table 4:Average Conifer Stand Conditions, 1913 vs. 1991.

Average Stand Characteristics	1913	1991
Number of trees/acre	20	106
Conifer diameter (inches)	28	16
Conifer basal area (sq. ft/ac)	89	141

Stand age (years)	300 (estimated)	182
Relative stand density (% normal basal area)	31	62
Annual mortality (per 10,000 conifers)	4 (0.04%)	52 (0.52%)

Conditions similar to Table 4 have been discussed in the literature as well, and have been inferred from numerous historical accounts, documented fire histories, and structures of uncut stands (Kilgore and Sando 1975; Parsons and DeBenedetti 1979; Bonnickson and Stone 1982; van Wagtendonk 1985; Biswell 1989; Weatherspoon and others 1992; Chang 1996; Skinner and Chang 1996; Weatherspoon and Skinner 1996)[15].

The shift away from the historic reference community has increased the project susceptibility to uncharacteristic fire effects (Allen et al., 2002; Agee and Skinner, 2005; Petersonet al., 2005; Noss et al., 2006)[16].The reference community forests embodiedstructural and compositional conditions resistant and resilient tofire (Fule, 2008; Stephens et al., 2008)[17].The reference community forest persisted through numerous past disturbance events and through multiplecenturies of climatic fluctuation (Agee, 1993; Allen et al., 2002)[18].

Fire Suppression

The probability of severe fire disturbance today is much higher than under historic vegetative conditions. To evaluate the current conditions of lands in relation to their historic or "natural" reference condition, an interagency standardized assessment method, Fire Regime Condition Class (FRCC), was developed to describe the degree to which vegetation condition and structure, fire frequency and severity depart from natural or historical ecological reference conditions (Hann et al. 2005)[19].

Historically the Pine Mountain Project fire regimes were within a range where the risk of losing key ecosystem components was low. Vegetation attributes (species composition and structure) were intact and functioning within the historical range. The Pine Mountain Project Planning Area would be classified as a Fire Regime Group 1, defined as *"a fire of a low severity burning in the area every 0-35 years"* (Rice 2006)[20]. A study conducted in the early 1990s in the Upper Main Eel watershed (LSRA P12) concluded the natural fire return interval was 10-21 years, with fires of low-intensity ground fires, having flame lengths of less than four feet. They were often followed by a pulse of conifer regeneration under the existing stand, and density controlled by the repeated short term fire interval.

However, early in the twentieth century fire suppression began to change the fire regime. Effective suppression efforts have virtually eliminated fire as a factor shaping vegetation within the Pine Mountain Planning Area in the last 80-100 years, and greatly altered the natural fire return interval, which is currently estimated to range between 43-57 years. Currently forested stands within the Pine Mountain Planning Area would be largely classified as a Condition Class 3, the most extreme departure from the historic fire regime. Fire frequencies have departed from historical frequencies by multiple return intervals. The results is a dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range, and the risk of losing key ecosystem components is high. Fire suppression efforts have changed the fire regimes from fire-maintained regimes to fire-initiated regimes.

Active fire suppression has developed a vegetation mix very different today than it was when fires burned frequently. Fire suppression effects on vegetation characteristics has been to substantially increase both live and dead fuel loading. Effects on forested landscape characteristics has been to substantially increase timber stand density and alter timber stand structure. Effects are expressed in tree density and structural characteristics that increase ladder fuel connectivity and uncharacteristic latter fuel density. (Refer to Figures 12 & 13) In addition, fire suppression has develop excessive to extreme ground fuel concentrations and abnormal canopy bulk density. High fuel loading in terms of ladder fuels and ground fuels produce higher intensity wildfires. Higher intensity wildfires increase larger diameter tree mortality rates or the occurrence of uncharacteristic wildfire events.

Prior to fire suppression, low intensity wildfire kept ground fuels, small conifers, and hardwood and brush sprouts to levels that posed only a minor hazard to fire intensity. When fires did not occur to kill the resulting regeneration, the trees continued to grow. The continued growth developedforest stands that are multi-aged.Commonly there are two to three age classes represented. The smaller trees in the stand are often not younger; they are simply suppressed trees that were not competitive with the rest of their cohorts of the same age.

Another effect attributed to the conifer regeneration is conifer intrusion into large diameter hardwood tree canopies or conifers overtoppinghardwood trees. The effect is the shading out individual trees or small hardwood patches. If the oaks are suppressed by conifer competition for a long enough time, both the tops and root burls will die. The long-term survival of oaks as a natural component of the mixed conifer forest type depends upon their maintaining vigorous root (burl) structure, which allows for rapid sprout regeneration following a wildfire or other disturbance event. Enabling hardwoods to have a significant competitive regeneration advantage over conifer seedlings. (LSRA, pgs. 18-19).

Suppression Era Fires

The Pine Mountain Planning Area has only experienced minor fire activity during the fire suppression era. However, the area surrounding the Pine Mountain Project has been subjected to large moderate, and high intensity stand replacing fires. Refer to the fuels specialist report for a more detailedinformation.

Table 5Back Fire Wildland Fire Characteristic Comparison

INPUTS	**Early Summer**	**Late Summer**
1 Hour Fuel Moisture (%)	7	3
10 Hour Fuel Moisture (%)	8	4
100 Hour Fuel Moisture (%)	9	5
Temperature (degrees)	80	90
Midflame Windspeed (mph)	10	10
RESULTS	**Early Summer**	**Late Summer**
Rate of Spread (ch/hr)	3.8	17.2
Flame length (ft)	5.8	16.4

Size after 2 hours (acres)	2.9	59.8
POI	48	100

The increase vegetation density attributed to fire suppression effects have rendered the stands more vulnerable to uncharacteristic wildfire**. Table 5 Back Fire Wildland Fire Characteristic Comparison** was develop to demonstrate the intensity difference between the early summer (June 2008) Back Fire burn compared to if the fire had occurred in late summer.

Results were derived from using FMA Crown mass program using stand data from an unburned area adjacent to the Back Fire boundary. The early summer Back Fire timing developed a mixed severity fire that included areas of crown fire destroying all vegetation combined with areas or low severity. The low severity areas express characteristics similar to historic fire effects. However, as weather condition change and late summer drier condition take affect the expected fire intensity increases. For example flame length increase from 5.8 feet to16.4 feet making the potential for crown fire and 100% tree mortality much more probable and more extensive than the early summer fire. Refer to the fuels specialist report for a more detailed information.

Timber Harvest Activities

Pine Mountain Project timbered stands had past management activities undertaken. Past timber harvest operations associated with this area were conducted in a manner that focused on high yield timber sales. Timber harvest operations ranged from partial removal of large diameter trees followed by natural regeneration; to later clear cutting operations followed by the establishment of tree plantations. The effects of these timber operations combined with fire suppression activities essentially enabled development within partially harvested areas of a dense understory small tree component that is expressed as an abnormal ladder fuel density and fragmented late-successional stands. Sustaining the pre-harvest ecosystem was not a driving force.

Aerial photo analysis, FACTS database query and on the ground reconnaissance concluded that partial harvest of large overstory trees began in the period 1942-1952, andcontinued up until 1988- 2001.Refer to Table 6 Harvest History.

Aerial photo Figure 1 circa 1942 and Figure 2 circa 1952 show little to no ground disturbance. Figure 3 a photo discovered in the MNF archives pictures a log truck being loaded on Forest Service road 17N23 dated 1954. Area Photos Figure 4 circa 1961 and Figure 5 circa 1969 indicate timber harvesting progression. Harvest operationscovered an extensive areawhich opened up the stands.Theextensive ground disturbance provided opportunities for natural regeneration to occur.

Table 6 Harvest History

Date	Partial Harvest Acres	Clearcut	Fire Salvage	Overstory Removal	Grand Total
1942-1952	986				
1952-1961	1778				
1961-1969	1569		1407		
1969-1979-	626				

Date	Partial Harvest Acres	Clearcut	Fire Salvage	Overstory Removal	Grand Total
1979-1988	408	635			
1988-2001	61	37		30	
Total Acres	**5428**	**672**	**1407**	**30**	**7537**

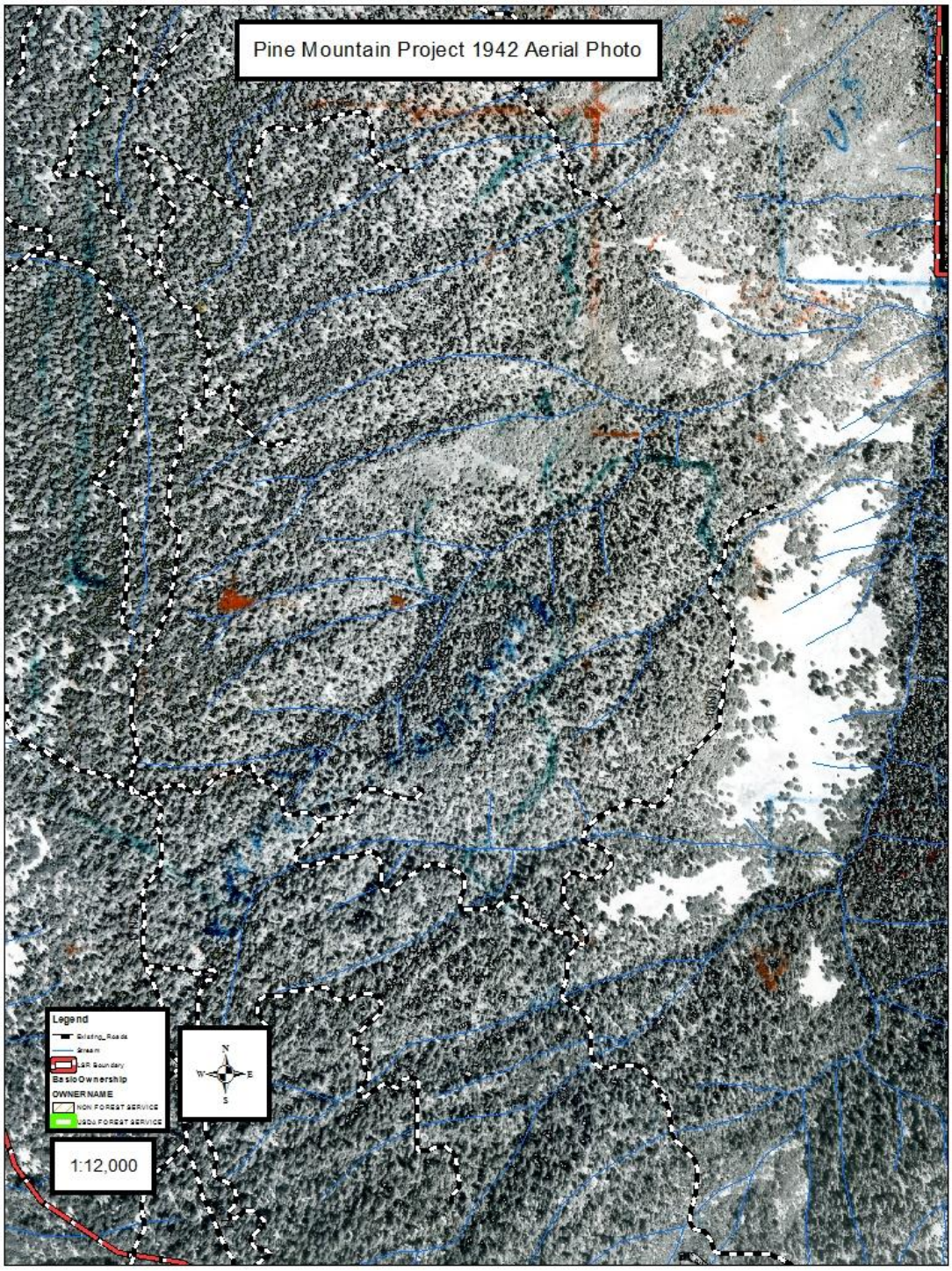


Figure 1 Pine Mountain Project 1942 Aerial Photo little to no ground disturbance.

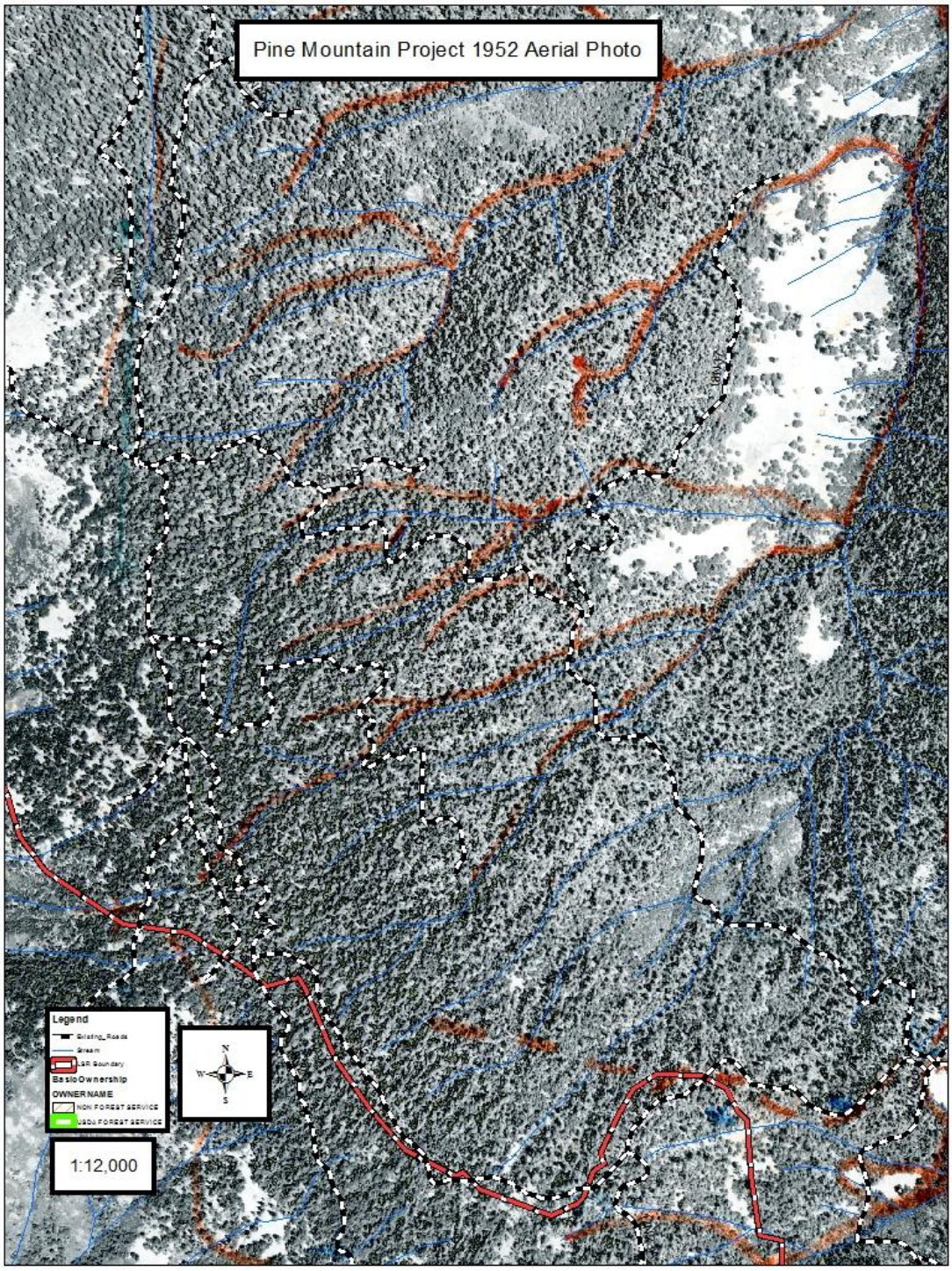


Figure 2Pine Mountain Project 1952 Aerial Photo little to no ground disturbance.

Figure 3Date 1954log truck being loaded on Forest Service road 17N23

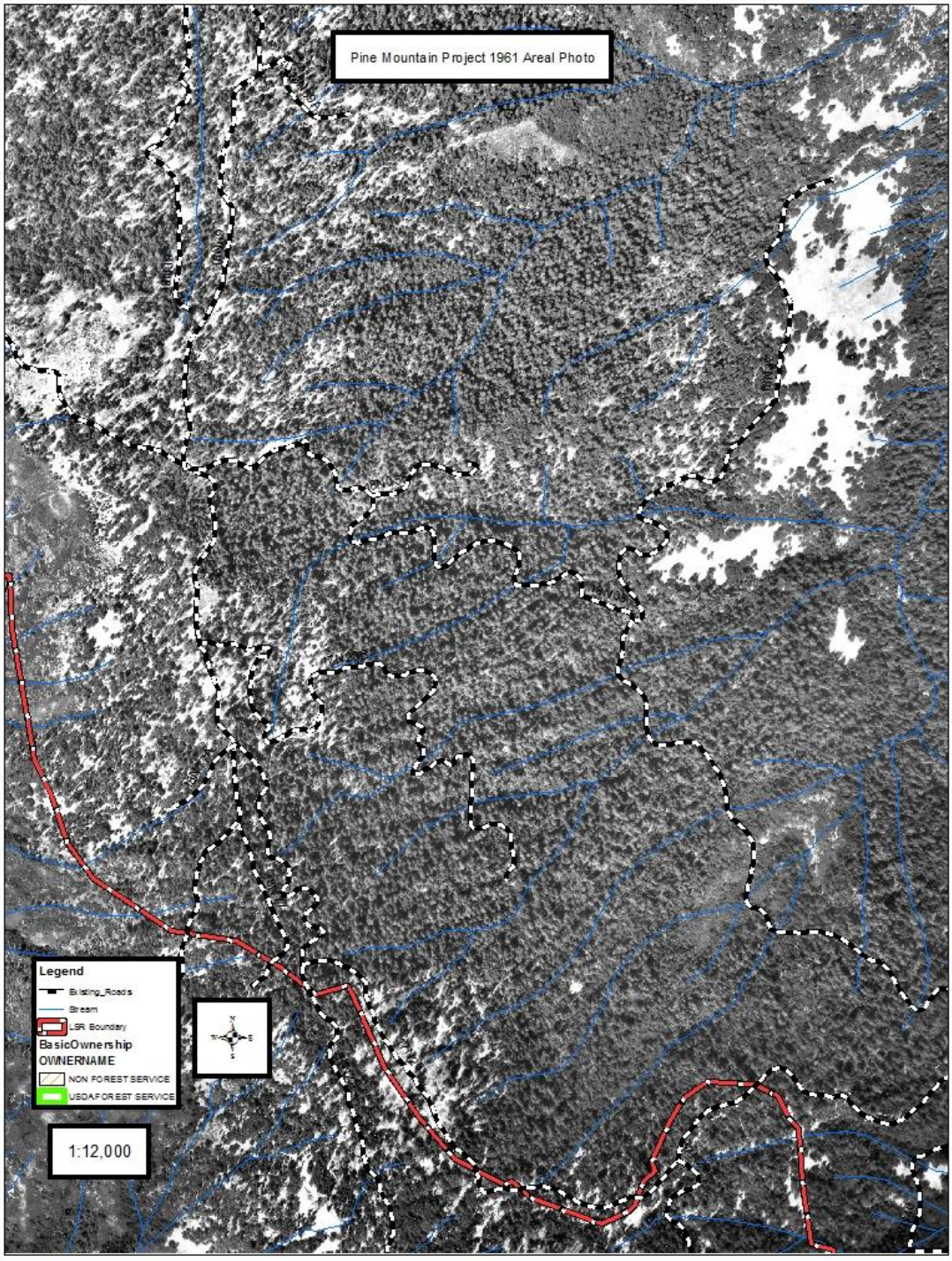


Figure 4Pine Mountain Project 1961 Aerial Photoshowstimber harvest ground disturbancealong Western Portion.

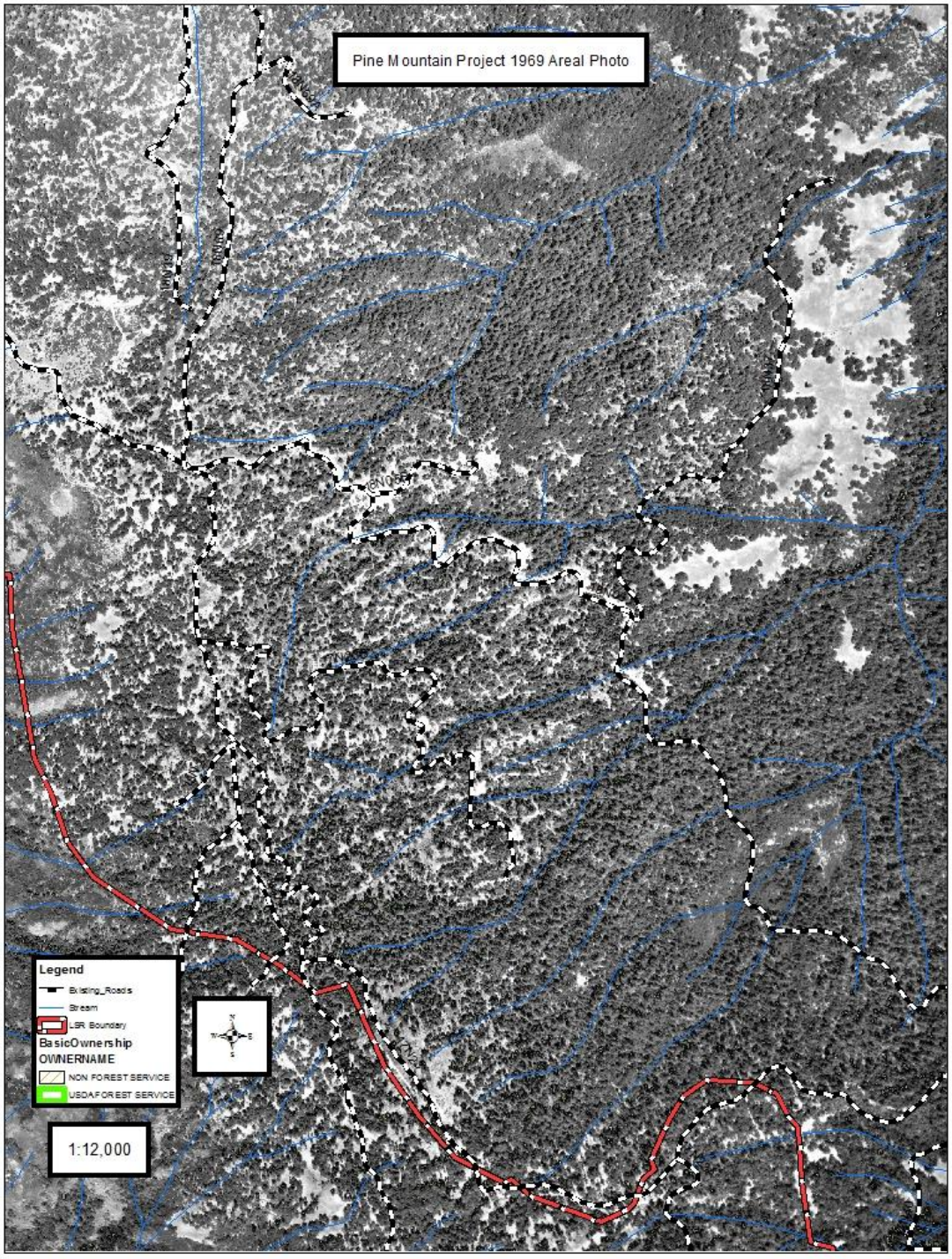


Figure 5Pine Mountain Project 1961 Aerial Photoshowsprogression timber harvest ground disturbance.

The 1980's began a period where clear-cut harvest operations resulting in establishment of approximately 700 acres of plantations. Refer to Figure 6 Pine Mountain Project 1988 Aerial Photo.

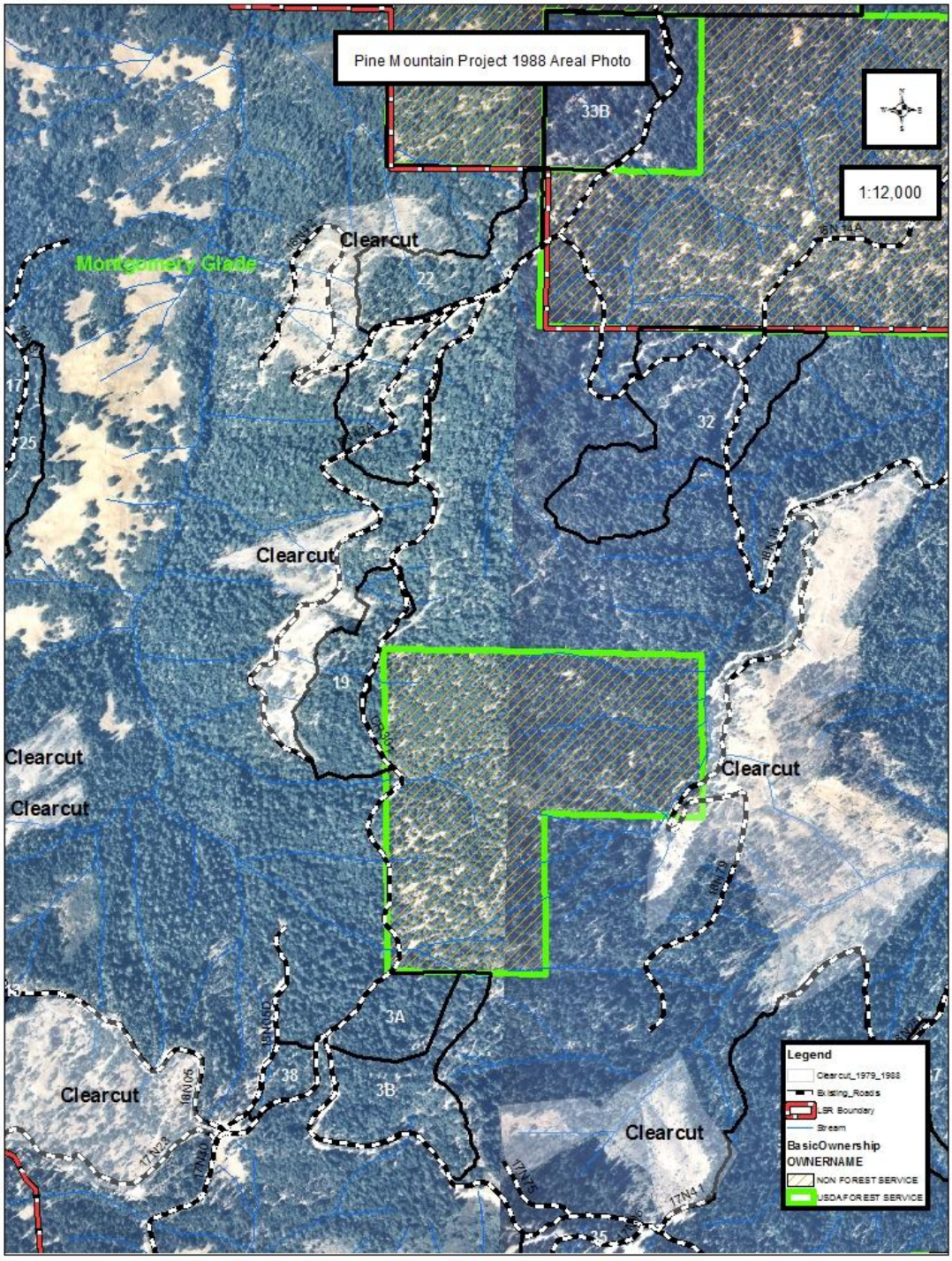


Figure 6Pine Mountain Project 1988 Aerial Photo show locations of some clearcut harvest units.

Most of these plantations need treatment in order to prevent competition-induced mortality and to increase diameter and height growth, thereby shortening the time period of extreme fire susceptibility, density related insect mortality and accelerating their development into late-successional stands.

Post-harvest forest development has established forest stands that have differing degrees of structural variation. . The effects of these timber operations combined with fire suppression activities essentially enabled the development of dense even-aged marginally differentiated timber stands. Forest stand structure also includes single storied early successional tree plantation stands, two storied stands, two storied stands with an occasional remnant old growth component and three storied stands. Single story plantation stands consist of 15-40 year old planted trees with varied degrees of planted and natural species diversity. Table 7 depicts some average values for attributes of these three layers.

Table 7: Average Attributes of Layers (Note: there is considerable variation around the averages)

Layer	Age	Diameter (in.)	Height (ft.)	Trees/acre
Layer 1	30-80	<10	10-60	500-1000+
Layer 2	80-120	10-30	90-150	80-120
Layer 3	200+	>30	170-210	0-20

Forest health)

Forest health is a measure of a forest overall capacity to maintain biological diversity, normal productivity, sustainability, and resilience to disturbance.

Project area field examination indicates that forested stands are densely stocked resulting in a high level of inter-tree competition. Contributing to a loss of stand vigor leading to increasing susceptibility to forest pests, especially during prolonged periods of low precipitation. Existing conditions are trending to a reduction in biological diversity, developing higher fuel loads, and increasing fire danger impacting stand resilience to disturbance and sustainability. The increased density has led to a downward trend in the presence, establishment and health of sugar pine, ponderosa pine and black oak trees.

Insect and Disease

Western Bark Beetle: The western pine beetle (*Dendroctonus brevicomis*) is the most devastating insect affecting ponderosa pine in California. Normally, this beetle breeds in windfalls, unhealthy trees, or in trees weakened by drought, stand stagnation, fires, and other beetle infestations, which usually leads to tree mortality (Keen 1952)[21].

Forest ecosystem health is affected by the high tree densities across the project area creating a situation conducive to increasing insect population. Insects and diseases at endemic levels create dead and down material and recycle nutrients into the ecosystem. However, they can also act as major disturbance agents with the potential to substantially change species composition. During this past decade the project area's mixed conifer stands influence by prolonged periods of low precipitation experienced an insect related die off of large diameter ponderosa pine trees. Mortality was especially severe in pines with a high density of Douglas-fir trees in close proximity similar to Figure 7. The affect developeda high level of moisture stress related inter-tree competition. The result was a loss of pine tree vigor, eventual insect attach and tree mortality. Mortality is found as individual tree or seen in pockets ranging in size from 3-5 trees to as many as 15 or more trees.The result is creating heavy surface fuel concentrations

around the standing larger pine trees. Contributing to a substantial increase in the potential for the project area to burn at high severity (where most mature trees are killed).

Figure 7 Ponderosa pine with competing Douglas-fir

The above described moisture stress situation has potential to impact tree plantations. Pine plantations tree density is creating an at risk situation for beetle attack. Management actions now have potential to prevent major beetle impacts.

Mountain Pine Bark Beetle: The mountain pine beetle (*Dendroctonus ponderosae*) has been observed attaching sugar pines in the Back fire location of the Pine Mountain Project area.

White Pine Blister Rust: White pine blister (Cronartium ribicola) rust is present in the Pine Mountain Project area. This introduced disease is associated with sugar pine the only white pine present. The disease is introduced by spores from the alternate host (gooseberry), usually on limb tips, and moves through the tree tissue toward the main trunk. In many cases, young trees are killed and older trees have tops or branches killed, but they also can be killed. This disease can reduce tree vigor to a point where other factors, including mountain pine beetle, can kill host trees. Blister rust was observed in minor amounts in field reviewed stands.

Dwarf Mistletoe: Dwarf mistletoe (*Arceuthobium* spp.) is an endemic disease found throughout the Pine Mountain Project area. Dwarf mistletoe is a host-specific (capable of living solely on or in one species) parasitic seed plant. Field reconnaissance identified mistletoe infection. Conifer

species most affected are Douglas-fir and ponderosa pine indicating that different dwarf mistletoe species are present.

Mistletoe severity is usually described by a relative index for the amount of host crown affected (Hawksworth et al. 2002)[22]. The six-class dwarf mistletoe rating (DMR) system developed by Hawksworth (in 1977)[23] is a commonly used mistletoe infection rating method. Approximately 50 percent of the trees that are severely infected (DMR 6) will die within the next decade (Hawksworth and Geils 1990)[24]. Tree growth particularly in pines begins to slow noticeably when DMR 3 is reached. In Douglas-fir, height growth and tree vigor may be reduced, but at low DMRs, tree effects are difficult to demonstrate.

Dwarf mistletoe's presence in the Pine Mountain Project area is a contributing factor to the development of late seral elements in infected Douglas-fir trees. Northern Spotted owls have been known to utilize mistletoe brooms as nest platforms. Douglas-fir dwarf mistletoe infections are present but not common and generally rate as a moderate infection (DMR 3 to 4). Branch deformity and brooms are normally found in crown positions near the lower third to mid upper half tree crown locations. In most cases, the upper portion of the crown in mid to late-successional-size codominant or dominant trees are healthy.

Dwarf mistletoe has been observed also in ponderosa pine. It has a definite influence on tree and stand health, particularly where edaphic (soil-related) factors or stand density place other limits on tree growth and health. Dwarf mistletoe presence is usually associated with increased inter-tree competition resulting in loss of vigor, and increasing susceptibility to attach from other forest pests

Figure 8Mistletoe infected Ponderosa Pine

The primary area of concern is the plantations developed in the late 1970's up until the early 2000's.The primary management concern is to remove heavily infested trees to reduce potential fuel loading.To protect and to promote overall tree and stand vigor and to minimize buildup of downed fuels, it is desirable to reduce the level of infestation. This control could be achieved by removing trees with a Hawksworth Dwarf Mistletoe rating of 5 or 6. A Hawksworth rating of 6 is the most severe infestation rating. Trees with ratings of 5 or 6 are in poor health and vigor and are very prone to die, as well as infest other adjacent healthier trees.

Conk rot or Red Ring Rot (Phellinus pini): Conk rot is present within the project area. The major host is Douglas-fir but also affects pines.

Identification:*P. pini* infests the heartwood of live conifers. (USDA Forest Service, unpublished Insect and Disease Training Manual, updated and revised 2009)[25]. Infected trees are identified by the hoof-shaped to bracket-like perennial conks on stems, often issuing from knots or branch stubs.

Relevance To Tree Quality: Early decay appears as a red to purple discoloration of the heartwood; advanced decay appears as numerous small pockets (1 mm x 2 mm) containing white mycelium (this kind of rot is commonly called "white speck") decay often occurs in concentric bands or rings. The disease is spread by wind-carried spores that germinate on wounds and branch stubs. The extent of decay is usually indicated by larger size and number of conks and wider spacing between them.

Management Concern: The primary management concerns are to maintain vigorous stands and to avoid scarring trees.

From A Forest Ecosystem Point of View: Cavity nesting species take advantage of the decay pockets to form nesting sites. Advance decay contributes to the susceptibility main stem breakage forming broken tops and other such suitable nesting structure

Figure 9Velvet-top fungus(Phaeolus schweinitzii)

Velvet Top Fungus, Phaeolus schweinitzii: One of the commonest root- and butt-rotting fungi infecting many conifer species. Pine Mountain Project fruiting bodies observations were associated with Douglas-fir trees.

Identification: Annual conks usually form on old wounds on the butts of infected trees, or on the ground, coming up from a decayed root. On the tree, thin brackets grow one above the other. On the ground, the conks are circular in shape, up to 10 inches across, sunken in the centre and tapering to a short thick stalk. Conks appear in late summer and fall. When fresh, the upper surface is velvety, concentrically zoned and reddish-brown with a light yellow-brown margin.

The lower surface is dirty green becoming red-brown when bruised and consists of numerous large pores with irregular outlines.The telltale fruiting bodies may not show up for many decades, and there are no other visible symptoms. By the time the fungus fruits are visible from the outside, there is substantial decay within.

Relevance to Tree Quality: Causes a brown cubical rot inthe heartwood of living trees. Decay is confined to the heartwood,within 10 feet from the ground,or roots.Old trees suffer most from infection,but the fungus can be parasitic on young trees. Infection is largelythrough basal wounds from fire, logging, soil compaction, or rootinjury. Fungus may also spread through the soil to infect roots andinfection may occur through root grafts. Extreme decay frequentlyresults in breakage or windthrow.

From A Forest Ecosystem Point of View: Velvet-top fungus works through the decomposition processto break down wood cells and slowly recycle minerals and nutrient.

Black Stain Root Disease, *Leptographium wageneri*: Black stain root disease is a vascular wilt disease that blocks the water conducting vessels of host trees. Trees with black stain root disease usually have sparse, chlorotic crowns and reduced terminal growth. Some may also have distress cone crops and basal resinosis. A mortality center is often evident, with old snags near the center, recent mortality farther out, and symptomatic, live trees at the edge.Bark beetles serve as a vector in spreading the disease.

Relevance to Tree Quality: Black stain progresses longitudinally and somewhat tangentially. Longitudinally, it forms long streaks following the wood grain. In cross section, it appears as arcs following short segments of annual rings (Figure. 10). Black stain does not cause decay.Bark beetles and woodborers frequently colonize trees infected with black stain root disease.

Figure 10Black stain in the lower stem with the wood exposed in transverse view.

MANAGEMENT CONCERN: The primary management concern center on preventing disease spread and minimizing site disturbance. Minimize injuries during skidding, falling and brushing operations, especially near young trees. Along skid trails remove injured trees of host species**.** Injured trees attract vectors.

From A Forest Ecosystem Point of View: Black stain root disease currently is found in small isolated patches. Black stain root disease creates snags of all sizes by causing tree mortality. It also commonly creates dead patches of small Douglas-fir trees. Trees killed by *L. wageneri* eventually contribute to levels of down wood when they break or fall over. Black stain root disease creates canopy gaps, facilitating a more diverse stand structure and at times a more diverse plant species composition, as less-susceptible or non-host trees, shrubs, and forbs are released or become established in the openings. Bark beetles frequently are attracted to trees infected with *L. wageneri*, providing good foraging habitat for woodpeckers.

Weather: Climate

The Pine Mountain Project area has a Mediterranean climate characterized by moderate temperatures, wet winters, and dry summers. Precipitation occurs primarily between October and March but can extend into May or June. Precipitation type vary depending on the location within the Pine Mountain Project area. Rain predominates in the lower elevations. Winter precipitation in the higher elevations may occurs as rain, snow, or a mixture of snow and rain. The snow level fluctuates throughout the winter in response to alternating warm and cold fronts. Shallow snow packs often build-up and then are quickly melted by rain or warm temperatures, or winds.

Weather: Drought

Native insects are a necessary part of the forest ecosystem. They are normally present at low levels and cause tree mortality only in localized areas. However, overcrowding, and weather condition that develop extended drought periods tends to cause moisture stress weakening trees and reducing their ability to withstand insect attacks. Normally trees use pitch to repel beetles trying to burrow through the bark. Drought weakened moisture stressed trees cannot produce the pitch needed to repel beetles. Enabling beetles to tunnel in and lay eggs that turn into larvae that feed on the inner bark. Attacking beetles release chemicals called pheromones that attract other beetles until a mass attack kills the tree, or spreads to include other trees.

Weather: Wind and Snow Events

Heavy snow and wind events occurred during the winter of 2009–2010. Significant damage is mostly confined to small diameter trees along the Pine Mountain Ridge area. These events have created conditions where trees and tree tops are broken-off at various heights resulting in thick accumulations of debris and material concentrated on or horizontally suspended above the ground. This situation has created excessive accumulations of surface fuel materials exacerbating potential wildfire conditions and pose a serious, ongoing threat to sustaining late-successional habitat

Climate Change:

Climate is not the weather—it is the prevailing or general long-term weather conditions for an area. Climate change refers to changes in long-term weather patterns. Climate change has

potential to move forest vegetation further from reference condition. Climate projections suggest altered precipitation regimes and increasing warming trend with warmer spring and summer temperatures

Warming and drying conditions will most likely cause increased fire activity: Other predicted effects of a warmer, drier climate include reduced growth and increased mortality (van Mantgem and Stephenson 2007, van Mantgem et al. 2009)[26]. Long-term adaptation to climate changes requires healthy and productive forests in the short term. The susceptibility and resilience of these forests to fire or pest disturbances, as well as their ability to adapt to future climate challenges may be compromised by a lack of vigor or diversity.

Warming temperatures which may lead to prolonged drought, have the potential to comtribute to continued tree water-deficienies leading to increase stress. Trees stressed by drought tend to have greater susceptibility to biotic agents such as insects and disease. Considering factors, there is a continued risk of losing more older, healthy fire resilient larger diameter trees. Climate induce stress has potential to inhibit growth and vigor affecting trees throughout the diameter range including mid and late seral trees. Climate change could also inhibit growth and vigor of established plantations if such areas do not adequately adjusted to climatic alterations combined with fire suppression alterations (Innes and Peterson 2004)[27].

These conditions have generated a perceived less sustainable system by increasing fuel risks and increasing the threat of reduced stand heterogeneity in the event of large-scale disturbances, such as from wildfire or beetle outbreak.

4.2 Desired Vegetation and Fuel Conditions

The Pine Mountain Project proposes treatments within three Management Areas and three Land Allocations as identified in the Mendocino National Forest Land and Resource Management Plan (LRMP). These Management Areas are Pine Mountain MA-20, Round Mountain MA8 and Ericson Ridge (MA-10). Land Allocations Riparian Reserves manage prescription RX 4, Late Successional Reserves manage prescription RX 6 and Matrix manage prescription RX 7. The matrix consists of those federal lands outside the following six categories: Congressional Reserves, Riparian Reserves, Administrative Withdrawals and Late-Successional Reserves. Matrix management direction as applied to Pine Mountain Project: RX 3 Chaparral Management; RX 4 Minimal Management: RX 7 Timber Modified. (Refer to Section 2.1 Forest Plan Management Direction)

Forest Plan goals, desired conditions and desired future conditions pertinent to managing vegetation in the Pine Mountain Project are summarized in Table 8 below.

Table 8 Management Areas, Land Allocations, Pertinent Goals, Standards and Guides, Desired Conditions (DC) and Desired Future Conditions (DFC).

Table 8 Management Area (MA) Land Allocation (LA)	Management Prescription	Acres within Proposed Thinning Units under Alternative 2, Proposed Action	**Forest Plan Goals, Standards and Guides, Desired Condition and Desired Future Conditions (Forest Plan & LSRA)**
MA 20 - Pine Mountain (Entire MA = LA Late Successional Reserve with associated Riparian Reserves)	Rx-6 (1-5), RX 4	Goal 1=1702 Goal 2= 924 DC: (1)=5669 DC: (2)=8000 DC: (3)=5669 DC(4)=6033 1 DFC=6033 (6) Objective: 1040 2 DFC=6033 1 DC=6033 3 DFC=6033 4 DFC=1702	Goal 1: Maintain or improve the diversity and quality of habitat needed to support viable populations of all native and desired non-native wildlife and fish species….(LRMP p. IV-4). Goal 2: Maintain and improve the ecological health of riparian and aquatic ecosystems Comment: Riparian reserve standards and guidelines (S&Gs) also apply to LSRs, and actions within riparian reserves located in LSRs must comply with all S&Gs for both land allocations. RX 6 LRMP DC: (1) Development of old-growth forest Characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; (FSEIS ROD p. B-5) DC: (2) Prevention of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations. (FSEIS ROD p. B-5) DC: (3) Thinning or managing the overstory to produce large trees; release advanced regeneration of conifers, hardwoods, or other plants: or reduce risk from fire, insects, diseases, or other environmental variables,(FSEIS ROD p. B-6) DC(4) Objective: Accelerate development of late-successional conditions 1 DFC: (5) while making the future stand less susceptible to natural disturbance. (6) Objective: To provide effective fuel breaks wherever possible.(FSEIS ROD p. C-12, 13) (Refer to LRMP IV-62 &63) LSRA 2 DFC: The long-term desired condition of the forested portion of these LSRs is characterized by: Late-successional forest stands occupy the maximum practicable and sustainable amount of the area of each LSR that is suitable for growing these

Table 8 Management Area (MA) Land Allocation (LA)	Management Prescription	Acres within Proposed Thinning Units under Alternative 2, Proposed Action	**Forest Plan Goals, Standards and Guides, Desired Condition and Desired Future Conditions (Forest Plan & LSRA)**
			stands.(LSRA 19) 1 DC: Stocking levels in young-growth and mature forest stands promote rapid development of old-growth characteristics (rather than rapid maturation) and protect these stands from large-scale disturbances. (LSRA 19) 3 DFC: Conifer and hardwood stand densities are low enough to survive extended droughts without excessive mortality of overstory trees from insects or disease. 4 DFC: Mid- to late-successional pine, mixed conifer, and hardwood stands are capable of enduring the effects of a mid-summer wildfire under normal severe conditions without setting the stand back to an earlier successional stage. (LSRA 20)
MA-8 Round Mountain (LA = Matrix Land with associated Riparian Reserves)	RX 7, RX 3, RX 4	364	LRMP Emphasize fuels treatment within and adjacent to plantations as a means to provide protection for plantations from wildfire. Provide a natural appearing landscape. (LRMP IV-112)
MA-10 Ericson Ridge (100 Acre LSR, Matrix Land with associated Riparian Reserves)	RX 6, RX 4 and RX 7	364	LRMP Emphasize fuels treatment within and adjacent to plantations as a means to provide protection for plantations from wildfire. 100 Acre LSR same desired conditon as MA-20

Table 8 Management Area (MA) Land Allocation (LA)	Management Prescription	Acres within Proposed Thinning Units under Alternative 2, Proposed Action	**Forest Plan Goals, Standards and Guides, Desired Condition and Desired Future Conditions (Forest Plan & LSRA)**
Riparian Reserves	RX4	Goal=5093 S&G=5093 DFC=5093	Goal: Maintain and improve the ecological health of riparian and aquatic ecosystems. S&G: Maintain and restore the species composition and structural diversity of plant communities in riparian areas. DFC: Silvicultural practices for riparian reserves be applied to control stocking to acquire or maintain desired vegetation characteristics needed to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability.
Matrlix Land with associated Riparian Reserves	RX 7 and RX 4	Goal=916 DFC=916	Goal: Provide a sustained yield of timber and other wood products to help support local economies and to contribute to meeting local, regional, and national needs. DFC: Manage with an “emphasis on timber production while providing for other resource objectives including visual quality, watershed, rare and endemic species, and wildlife.” (LRMP, IV 69). Management Direction calls for the regulation of “… all timber yields from suitable timber lands” and to “Intensively manage timber stands for control of competing vegetation, stocking control, etc” (LRMP, IV-70).

In addition, to LRMP and LSRA desired condition guidance direction was pursued from the USF&W. The USF&W suggested following their directions to private timberland in California’s Northern Interior Region where the Pine Mountain Project is located.This document titled “Regulatory and Scientific Basis for U.S. Fish and Wildlife Service Guidance for Evaluation of Take for Northern Spotted Owls on Private Timberlands in California’s Northern Interior Region”(USF&G 2008) contains stand metrics needed to avoid habitat impact which would lead to NSO take situation. Table 9 presents the minimum requirements for Take Avoidance. These habitat requirement will serve to guide NSO effectsanalysis. Note in order to avoid take all of the structural parameters values must be achieved.

Table 9: USF&W Stand Structural Parameters

Parameter*	Functional Habitat Type			
	High-quality Nesting/Roosting	**Nesting/Roosting**	**Foraging**	**Low-quality Foraging**
Basal area	≥ 210 ft2 /acre	A Mix ranging from 150 to ≥180 ft2 /acre	A Mix ranging from 120 to ≥180ft2 /acre	Mix ranging from 80 to ≥120ft2 /acre
Quadratic mean diameter	≥ 15 inches	≥ 15 inches	≥ 13 inches	≥ 11 inches
Large trees per acre ≥26 DBH	≥ 8	≥ 8	≥ 5	Not Applicable
Canopy closure	≥ 60%	≥ 60%	≥ A Mix ranging from 40 to 100%	≥ 40%

*Parameters for classify nesting/roosting and foraging habitat for NSO in the Northern Interior Region

5.0 Environmental Consequences

5.1 Analysis Methodology

This analysis is based on the project area and treatment unit areas available existing data; data collected specific to the project area treatment units; research material and literature; forest wide assessments, field reviews and information received from public scoping.

To describe the project area vegetation characteristics current conditions have been determined using information obtained from the watershed reports for the Upper Main Eel River Watershed and Upper Lake Watershed. Vegetation attributes such as vegetation cover type, seral stage, NSO habitat type were developed through office evaluation followed up by field review to verify site conditions.

More detailed data has also been collected at the proposed treatment unit scale. Individual stand inventory data provided information regarding current treatment unit conditions. These new stand exams for the selected commercial treatment units, were accomplished using the Common Stand Examination inventory protocol field surveys. They were accomplished in 2008 and 2011. Stand characteristics such as species, trees per acre, seral stage, and NSO habitat type were then analyzed to refine potential treatment areas.

Other data sources for analysis of existing vegetation conditions were from the Forest Service Activity Tracking System (FACTS), Forest Inventory and Analysis (FIA), Remote Sensing Lab (RSL) Existing Vegetation – GIS layer database (USDA 2011a), aerial photography dating from 1940s through 2010, NAIP Air Photo imagery 2009-2010, and Mendocino National Forest GIS data base Library[28].

The Forest Vegetation Simulator (FVS) program (Dixon 2002) was used to assist in modeling and predicting the effects of treatments on Cover Types and structure (size class, densities and canopy layers) tree growth, stocking, and canopy fuels. FVS provides probable outcomes to compare alternatives and fine tune silvicultural treatment prescriptions. FVS modeling is an

approximation of actual conditions. The modeling does not replicate exactly the existing conditions or conditions that would occur after treatments. For this analysis, FVS was used to generally characterize and display existing conditions and to approximate the nature and magnitude of treatment effects to support NEPA decision process.

Treatment prescriptions were based on the existing vegetation compared to desired stand conditions. Treatment prescriptions were then assigned to the proposed treatment areas based on topography, slope, and access.

Post-treatment modeling, using FVS Inland Klamath Mountains (NC) variant supplied the post-treatment conditions for the representative seral stages and NSO habitat vegetation structure.

The FlamMap software program was used to analyze fire effects. Fire effects were measured as percent of area expected to have a crown fire under 97th percentile weather condition. FlamMap develops expected fire types (Surface fire or Canopy fire). Develops a flame length measurement corresponding to fire type. Refer to the fuels specialist report.

Project analysis shall develop stand basal area (BA), percent stand density index (SDI%), total trees per acre (TPA), quadratic mean diameter (QMD), number of trees per acre $\geq$26" DBH, percent canopy cover, flame length and potential fire type. These measurements shall be used to describe the treatments, their effects, and comparisons with historic, desired, and existing conditions.

5.2 Spatial and Temporal Context for Effects Analysis

Vegetation direct and indirect effects analysis involves three spatial scales.Measurement indicators will serve to guide the analysis. First, treatment effects will be analyzed at the treatment prescription level. Second, the cumulative effects analysis will include discussion on activities and events relative to vegetation management that occurred on all National Forest System (NFS) lands within the 10200 acre Pine Mountain Project area. The Pine Mountain Project Area-level changes will focus on the changes in habitat protection and enhancement based on the indicators listed above, or developed as part of the effects analysis. Third, a portion of the Upper lake Ranger District that the project compliments other fuel reduction, habitat restoration vegetation treatments (Landscape level).

The short-term effects are considered to be those that are expected to occur immediately upon treatment implementation out to 10 years post treatment. Modelled Long-term effects are presented beginning in 2024 and every 10 years thereafter up to the year 2054 a thirty year period.

5.3 Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Affected environment includes recent past actions and historic actions that have impacted the existing condition. Direct and indirect effects consider treatments associated with the action and no action alternatives. Cumulative effects are those of past, current, and future foreseeable actions where the effects are interactive (i.e., synergistic). Foreseeable actions are noted in Chapter 1 of the EIS.

The Council on Environmental Quality's (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) define cumulative effects as the environmental impact that

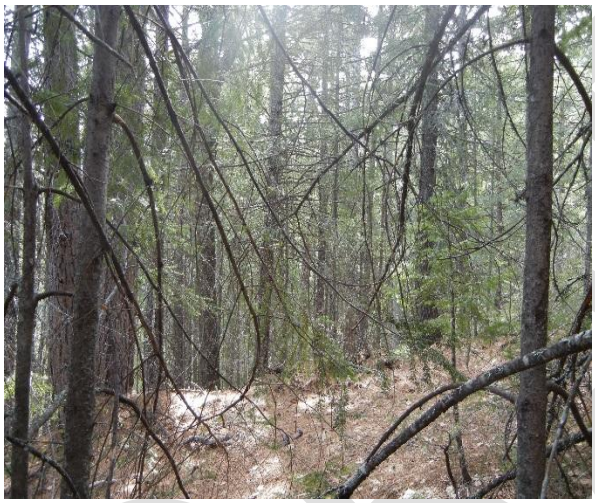
results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).

6.0 Alternative 1 – No Action

6.1 Direct and Indirect Effects

By definition, direct and indirect effects (40 CFR 1508.8), and cumulative effects (40 CFR 1508.7) result from the proposed action, and thus are not germane to the no action alternative.

Under Alternative 1, no fuels treatments, forest health or habitat enhancement treatments would be implemented to accomplish the purpose and need. The intent and the desired condition set forth the LRMP and NWFP would not be achieved. Homogenous and tightly



spaced forested stands would remain, Refer to Figure 11.

Figure 11: Homogenous and tightly spaced forested stands

Fuel loading would continue to increase Figure 12.

Figure 12:Density Related Fuel Loading

Habitat diversity for late successional species would continue to decline Figure 13
Figure 13: Hardwoods and Ponderosa Pine succumbing to density impacts

6.1.1 Treatment indicators

The USF&W indicators, the Trees per Acre-Diameter Class and Stand Density Index Indicators which are all measurement of stand density point out that competition-related mortality is expected to increase as resources on the sites become increasingly limited. These two factors, in combination, lend to a greater risk of large severity fires as well as greater risk of insect and disease outbreaks at a much larger scale. In addition, the potential loss of late successional habitat would have serious implications considering Pine Mountain LSR's physical location being the southernmost functioning LSR on the Mendocino National Forest. While no costs would be directly incurred with this alternative, future costs may include wildfire suppression and rehabilitation activities and potential loss of late successional habitat. Maintenance related to safety would continue to take place as needed.

6.2 Cumulative Effects

By CEQ definition, there can be no cumulative effects from no action.

Because there are no direct or indirect effects as a result of the no action alternative, no cumulative effects would occur.

7.0 Alternative 2 – Proposed Action

7.1 Project Design Criteria, Mitigation Measuresand Prescription Development

The project area is a suitable candidate for landscape level fire-reintroduction once the treatment prescriptions have altered stand density and shifted forest composition and structure towards a more historic reference condition. Planned treatments are the initial step toward system resiliency and sustainability.Follow-up treatments on an as needed basis for example, thinning trees less than or equal to 10 inches DBH and applying prescribed fire to reduce surface fuels (including activity fuels) or maintain them in the desired condition are likely to assist in maintaining desired species and stocking; as well as, reintroducing fire as a reoccurring disturbance. Treatments would ultimately lead to a more resilient, diverse and sustainable forest.

Table 10.Proposed Treatment Prescriptions Acreageby Land Allocations

Treatment Prescriptions	LSR Acres	Matrix Acres	RR Acres LSR	RR Acres Matrix	Total Acres
Treatment Prescription 1 - Ecological Fuel Reduction Treatment -- Plantations Areas	349	15	152	0	364
Treatment Prescription 2 - Ecological Fuel Reduction Treatment -- Naturally Forested Areas	2797	726	1849	385	3523
Treatment Prescription 3 –Ecological Fuel Reduction Treatment -- Commercial Thinning	1512	190	594	92	1702
Treatment Prescription 4 - Ecological Fuel Reduction Treatment -- Shaded Fuel Break	82	63	65	56	145
Treatment Prescription 5 - Ecological Fuel Reduction Treatment -- Chaparral Management	669	1153	944	596	1822
Treatment Prescription 6 - Ecological Fuel Reduction Treatment -- Back Fire Area	444	0	268	0	444
Treatment Prescription 7 - Riparian Reserve Management**					
Total	5853	2147	3964	1129	8000

*Fuelbreak acres outside of another unit

**Prescription 7 Acres reported in the RR LSR and RR Matrix Columns

7.2 Treatment Prescription 1 - Ecological Fuel ReductionTreatment -- Plantations Areas.

Treatment 1 is a thinning treatment prescription that is a fuel reduction treatment focused on treating previously establishedearly succession plantation stands.The treatment will be applied to trees that depending on market conditions may have value as biomass products, but do not have a commercial value as lumber products.

This treatment applies to land designated as Late Successional Reserve, Known Spotted Owl Activity Centers (100 acre Late Successional Areas), Riparian Reserve and Matrix encompassing 364 acres. Refer to Table 10. Proposed Treatment Prescriptions Acreage by Land Allocations. Fuel treatments may be applied as prescribed fire only or as a combination of prescribed burning, hand or mechanical density reduction (thinning), hand or mechanical piling, or chipping. Treatments may be followed on an as needed basis by thinning and prescribed fire to reduce surface fuels or maintain them in the desired condition.

7.2.1 Thinning Treatment

The thinning treatment shall be applied to reduce the number of trees per acre. Residual tree spacing shall range from approximately 15-30 feet. Spacing may vary by 25% less or greater than the expressed range to allow for variability of density and selection of the best leave trees. Implementation may be by hand (chainsaw) or mechanized equipment (i.e. masticator or feller-buncher), depending upon slope constraints as described in the design features.

Retain the largest and most vigorous trees. The desired leave tree selection priority is as follows: hardwoods, sugar pine, Douglas-fir, and ponderosa pine. Retained hardwood sprout clumps should be thinned to retain the 2-3 most vigorous, dominant sprouts. Prune the lower branches of leave trees as needed to raise the canopy height and reduce ladder fuel connectivity. Where available retain any existing predominant tree.

Where feasible, avoid thinning pine-dominated plantations between February 1 and July 15 to avoid creating conditions for potential bark beetle breeding, buildup and outbreaks, unless slash can be promptly disposed of by chipping, mastication, removal or burning.

7.2.2 Snag Retention

No snags ≥20" DBH shall be felled, unless deemed a safety hazard or risk to prescribed fire control. Hazardous snags will be felled and remain on site as coarse woody debris (CWD).

Back Fire Exception: For those units, or portions thereof, that were affected by the 2008 Back Fire retain a minimum of 4 large snags per acre minimum diameter 15 inches and preferably ≥20inches DBH, unless deemed a safety hazard; if there are less than 4 snags/acre ≥20" DBH, retain the 4 largest snags available (Late-Successional Reserve Assessment, pg. 52).

7.2.3 Coarse Woody Debris retention (CWD)

Retain existing large CWD (≥20 inches in diameter, or largest available) up to a total of 5-10 tons/acre.

7.2.4 Surface and Ladder Fuel Treatments

Slashing/fuels treatments:
Treated material would consist of existing surface downed woody debris and slash created from thinning treatments.Material would either be chipped and distributed throughout the treatment area, burned on site in piles (hand or mechanically piled), or taken off site. Trees may be pruned to raise canopy base height.

7.2.6 Riparian Reserve Treatments

Refer to **Treatment Prescription 7 Riparian Reserve Management** for specific operations within Riparian Reserve.

7.3 Treatment Prescription 2 - Ecological Fuel Reduction Treatment -- Naturally Forested Areas

Treatment 2 is an understory thinning prescription that is a fuel reduction treatment applied to forested areas that express early, mid or late successional structure. The treatment will be applied to trees that depending on market conditions may have value as biomass products, but do not have a commercial value as lumber products.

This treatment applies to land designated as Late Successional Reserve, Known Spotted Owl Activity Centers (100 acre Late Successional Areas), Riparian Reserve and Matrix encompassing 3523 acres. Refer to Table 10. Proposed Treatment Prescriptions Acreage by Land Allocations. Treatment 2 may be applied as prescribed fire only or as a combination of prescribed burning, hand or mechanical density reduction (thinning), hand or mechanical piling, chipping, or pile

burning. Treatment 2 may be followed on an as needed basis by prescribed fire to reduce surface fuels including activity fuels and maintain them in the desired condition.

7.3.1 Understory Thinning

Where natural stand development has created areas that contain trees less than or equal to 10 inches DBH, understory thinning shall focus on the reduction of trees less than or equal to 10 inches DBH.Residual trees within these areas may be spaced15-25 feet in the understory of larger trees as long as there is spatial crown separation between the base of the upper canopy and lower canopy trees. Leave trees should not have potential to grow into the canopy of larger diameter dominate or co-dominate trees. Spacing may vary by 25% to allow for variability of density and selection of the best leave trees. Implementation may be by hand (chainsaw) or mechanized equipment (i.e. masticator or feller-buncher), depending upon slope constraints as described in the design features.

Retain the largest and most vigorous trees. . The desired leave tree priority would be as follows: hardwoods, sugar pine, ponderosa pine, and Douglas-fir. Retained hardwood sprout clumps should be thinned to retain the 2-3 most vigorous, dominant sprouts. Prune the lower branches of leave trees as needed to raise the canopy height and reduce ladder fuels. Retain any existing predominant trees where available.

Where feasible, avoid thinning pine-dominant areas between February 1 and July 15 to avoid creating conditions for potential bark beetle breeding and outbreaks, unless slash can be promptly disposed of by chipping, mastication, removal or burning.

Exception Clearance around Individual Trees: Trees less than 20 inches DBH may be removed from around individual large diameter conifer trees and hardwood species. This treatment is intended to enhance individual tree growth potential and longevity. When removal is applied to trees that are of size to provide large woody debris, they may be left to enhance woody debris retention where needed. Conifer trees may be removed from beneath the drip line and out to a distance of 5 feet from the hardwood crowns to enhance sunlight and growing space. Individual large diameter ponderosa pine and sugar pine species shall be treated to enhance their growth potential, longevity and fire resiliency by removing trees to cause crown separation of a minimum of ten feet from nearby trees canopies

7.3.2 Snag Retention

No snags≥20 Inches DBH shall be felled, unless deemed a safety hazard or risk to prescribed fire control. Hazardous snags will be felled and remain on site as coarse woody debris (CWD).

Back Fire Exception: For those units, or portions thereof, that were affected by the 2008 Back Fire retain a minimum of 4 snags ≥20" DBH, unless deemed a safety hazard. If there are less than 4 snags/acre ≥20" DBH, retain the 4 largest snags available (Late-Successional Reserve Assessment, pg. 52).

7.3.3 Coarse Woody Debris retention (CWD)

Retain existing large CWD (≥20" diameter, or largest available) up to a total of 5-10 tons/acre.

7.3.4 Surface and Ladder Fuel Treatments

Slashing/fuels treatments

Treated material would consist of surface downed woody debris and slash created from thinning treatments.Material would either be chipped and distributed throughout the treatment area, burned on site in piles (hand or mechanically piled), jackpot or understory burned, or taken off site. Treatment objective maintain 5-10 tons/acre. Trees may be pruned to raise canopy base height.

7.3.5 Riparian Reserve Treatments

Refer to **Treatment Prescription 7 Riparian Reserve Management** for specific operations within Riparian Reserve.

7.4 Treatment Prescription 3 –Ecological Fuel Reduction Treatment -- Commercial Thinning

The initial treatment follows LSRA guidelines to treat within forested areas to protect forested areas before treating bordering non-forested areas. (LSRA pg. 45) This treatment prescription will be applied to various forested areas that express mid or late successional structure which are located on or near ridgetops or upper slopes. Treatment operations would utilize whole tree removal methods, or removal of the last log with tops still attached. Tree removal will be accomplished by a ground-based system. Activity fuels not brought to the landing during operations may be hand or machine piled and burned if levels exceed desirable surface loading for subsequent prescribed underburning. Slash brought to the landing would be burned on site or utilized as biomass feedstock in on or off site processors, or returned to the various locations within the units. When activity fuels are relocated within the unit they may be treated by burning or left in place as CWD. Post-harvest prescribed underburning would be utilized to further reduce fuel loadingor tomaintain in a low state the surface fuel loads.

The intent of the prescription is to promote or sustain late successional habitat by working within current stand heterogeneity. The current heterogeneity is expressed in the variable density found in stand structure as related to tree size distribution, stem spatial patterns, species composition and stand dynamic processes (growth, mortality and regeneration). Ecological enhancement thinning will incorporate the intermediate silvicultural practice thinning from below combined with certain aspects of variable density thinning.

Applied ecological enhancement thinning treatments aim to enhance biodiversity through focusing tree retention on leave trees that provide habitat with structural diversity more suitable to late successional species. Ecological enhancement thinning addresses appropriate tree density reduction to open the lower story canopy to enhance NSO habitat, reduce competition and develop resiliency.

7.4.1 Thinning from Below with a Variable Retention Objective

Thinning From Below is a silvicultural technique in which lower story trees (usually subdominant trees) are removed. The objective is to reduce the density by increasing the spatial separation between the trees that make up the lower story canopy and the trees that make up the upper story canopy.

Thinning from below will serve to reduce ladder fuels, help raise stand height to crown base, and separate overstory tree crowns from lower story tree crown. Only minor removal of codominant trees which along with dominant and predominant trees provide the canopy structure characteristic that expresses suitable NSO and late successional habitat. No dominant or predominant trees will be removed.

7.4.2 Variable density thinning:

Variable density thinning is a thinning approach used to create, sustain or restore spatial, structural and compositional heterogeneity throughout the stand. Thinning shall strive to maintain the current mosaic of variable species composition and habitat niches. This approach modifies a traditional thin from below so that a stand is not uniform following treatment.Variable density thinning concept strives for variation in the residual stand, not uniformity.

Elements of variable density thinning that will be incorporated into this project to create or enhance spatial heterogeneity in composition and structure similar to that found in late-successional forests include:

1. Different thinning intensities among units based on seral stage and whether the stand is northern spotted owl nesting/ roosting, foraging or dispersal habitat
2. Some portions of the stand may not be entered to remove trees greater than 10 inches, but may have tree less than or equal to 10 inches removed. Also, prescribed fire may be applied. (Skips).
3. Some portions of the stand may favor hardwood group retention.
4. Some portions of the stand may have lesser spacing retention objectives for large diameter trees and larger spacing retention objectives for smaller diameter trees.
5. Some portions of the stand may have a requirement for greater clearance around a particular tree species.

The proposed thinning would be applied on approximately 1702 acres of mixed conifer stands. Refer to **Table 10. Proposed Treatment Prescriptions Acreage by Land Allocations.** The treatment goal is to sustain a stand that:

1) Continues to provide spotted owl habitat;
2) Provides habitat for other late-successional species;
3) Is more resilient to fire;
4) Possesses, protects and develops an adequate component of larger trees with cavities and defects for nesting/roosting structures, foraging opportunities and dispersal qualities; and
5) Is of appropriate density to maintain the stand in a reasonably vigorous and healthy condition to extend the retention of the large, mature trees and other attributes of

suitable late successional habitat such as snags and coarse woody debris(CWD) for as long as possible.

The treatment focus is to retain the largest trees that express late seral elements and promote healthy black oak and madrone trees wherever possible. The larger diameter trees are generally at or above the average canopy and have the best opportunity to take advantage of onsite resources to maintain or increase growth. The larger diameter trees generally express a higher degree of fire resiliency. Treatments are designed to maintain the existing native species diversity, including hardwoods, within the unit being treated. The treatment will emphasize retaining the following types of trees:

- All pre-dominant conifer trees (larger, older trees left from previous stands that express late seral structural elements such as large branches, cavities and other structures suitable for nesting, denning and resting), and diameters generally greater than 39 inches DBH;
- All dominant conifer trees as required by the LSRA. Tree diameters are generally 30 to 38 inches DBH;
- Codominant and intermediate conifer trees with growing space in the canopy for crown development. These trees express live crown ratios generally greater than 30 percent and diameters generally less than 30 inches;
- Healthy dominant or codominant hardwood trees (particularly black oak and Pacific madrone).

The treatment will develop species specific retention areas and species specific individual tree growing space enhancement:

- **Retention Areas (Skips):** These areas will not be treated to remove trees greater than 10 inches DBH. They are small areas generally one half acre to two and a half acres which contain coarse woody debris (CWD) concentrations, or hardwood concentration not requiring treatment to reduce conifer encroachment. These areas may be included in prescribed fire treatments.

- **Hardwood Retention Group Areas:** Hardwood retention group areas will be prescribed with the removal of encroaching conifer that are over topping the hardwoods and impeding their growth and vigor. Conifer trees will be removed from beneath the drip line and out to a distance of 5 feet from the hardwood crowns to enhance sunlight and growing space.

- **Variable Spacing Retention Objectives:** The retention objective for larger diameter trees shall focus on shorter spacing distance to maintain canopy closure. Smaller diameter trees spacing distances will focus on larger spacing distances to develop crown and stem diameter to encourage and to enhance late seral habitat structural characteristics.
- **Clearance Around Individual Trees:** Individual large diameter ponderosa pine, sugar pine and hardwood species with black oak being the predominant large diameter hardwood species shall be treated to enhance their growth potential and longevity by

removing trees from the east, south and western quadrants to cause crown separation of a minimum of five feet from nearby trees canopies.

First priority for removal would be the smaller trees generally 20 inches DBH or less. These trees were established as a result of past harvest activities, or other disturbances. They are usually present below the average canopy and are impacting the larger diameter trees as a result of competition for light, water, and nutrients. Some codominant trees would also be removed to increase growth of adjacent trees and to meet the desired residual stand density. Generally, the following types of trees would be removed from the stand:

- Suppressed conifers (diameters generally less than 14 inches);
- Intermediate conifers without growing space in the canopy for crown development (diameters generally less than 20 inches);
- Codominant conifers that do not have growing space in the canopy for further crown development (diameters generally less than 24 inches), or
- Codominant trees needed to reduce stand density to desired levels; and
- Codominant, intermediate, and suppressed conifers adjacent to pre-dominant conifers, or dominant / codominant hardwoods, to enhance survival of theses leave trees.

The treatment will retain wildlife habitat elements:

- **Snags:** Retain all snags ≥20" DBH, unless deemed a safety hazard or which have the potential to spread fire (fall/spot) across control lines. Hazardous snags and snags ≥20 inches DBH felled to facilitate burning operation will be retained as coarse woody debris (CWD).
- **Coarse Woody Debris:** Retain existing large CWD (≥20" diameter, or largest available) up to a total of 5-10 tons/acre.

7.4.3 Riparian Reserve Treatments

Refer to **Treatment Prescription 7 Riparian Reserve Management** for specific operations within Riparian Reserve.

7.5 Treatment Prescription 4 - Ecological Fuel Reduction Treatment -- Shaded Fuel Break

Shaded Fuelbreaks are a fuel-reduction technique for forested areas where vegetation is reduced and/or modified to reduce fire hazard in strategic locations on the landscape. Shaded fuelbreaks treat surface, ladder fuels and tree canopy bulk density. This break in fuel continuity is expected to change fire behavior. Fuel reduction activities will create safer and more effective areas for fire-suppression efforts, and contribute to future prescribed fire activities. The proposed treatment would be applied on approximately 1040 acres of mixed conifer stands. Refer to **Table 10. Proposed Treatment Prescriptions Acreage by Land Allocations.** However, only 145 acres are not within other treatment units. The shaded fuel break is designed to be 500 feet in width covering 250 feet of each side of an associated road or may vary larger on one side or the other depending on slope or ridgetop location.

Where the fuelbreak passes through proposed treatment units, the appropriate unit-specific prescriptions would be applied. Therefore, within the fuelbreak the unit specific treatments would be applied in plantation areas or in naturally forested areas. In addition, prescribed fire may be appliedto further reduce fuel loadingor to maintain in a low state the surface fuel loads. These treatments would be accomplished through mechanical and hand thinning, piling, and burning.

Where the fuelbreak does not pass though the proposed treatment units, the proposed fuelbreak treatment would be limitedto thinning small diameter trees following Treatment Prescriptions 2. Where chaparral dominates, specifically the north end of the fuelbreak on slopes greater than 35% with high and very high erosion hazards, brush patches of up to 10-15 feet in diameter would be retained to a 30-50 feet spacing between adjacent brush patches.

7.5.1 Snag Retention within Fuelbreaks

Retain one snag per quarter-mile of fuelbreak length, where available, preferably a non-hazardous larger tree.

7.5.2 Coarse Woody Debris Retention within Fuelbreaks

Retain one large log/acre, not to exceed 5 tons/acre, and not located within 50 feet of a road.

7.5.3 Hardwood Retention within Fuelbreaks

Hardwood trees shall be retained as to enhance late successional habitat.

7.6 Treatment Prescription 5 - Ecological Fuel Reduction Treatment -- Chaparral Management

The treatment consists of using prescribed fire as the primary tool for strategic fuel reduction that breaks up the continuity of large chaparral fields without resulting in large-scale changes in habitat type. Prescribed fire use will stimulate chaparral regeneration, contribute to the development of, diversity in seral stages and reducing fuel loading. Prescribed burning will be conducted to minimize impacts to forested areas intermixed within areas dominated by chaparral fields. Protection measures may include activities such as using strategic ignition areas. Strategic ignition may include using tactics such as lighting above a forested area, lighting along a ridgelines, controlling distance between active ignitions, and using natural barriers. Prior to actual burning activities preparation operations may include hand or mechanical thinning of small diameter trees following Treatment Prescriptions 2, brushing of roads,fire line construction and brush removal.

Fire lines construction may be necessary in order to keep prescribed fires contained to unit boundaries, to protect certain features within unit boundaries (e.g. large snags, witness trees, or infrastructure), or to limit the area that is burned in a given day (e.g. for reasons of air quality). Burning would be performed by hand and/or aerial ignition sources. Within the treatment areas, a mosaic of burn severity would be created. In general, this mosaic would be based on existing vegetation conditions.

7.6.1 Riparian Reserve Treatments

Refer to **Treatment Prescription 7 Riparian Reserve Management** for specific operations within Riparian Reserve.

7.7 Treatment Prescription 6 - Ecological Fuel Reduction Treatment -- Back Fire Area

This treatment applies to Units 77 and 79. The treatment consists of using prescribed fire for reducing surface fuel loading and maintaining fire return interval within the 2008 Back Fire perimeter. Burning would be performed primarily by hand or aerial ignition sources. Thinning small diameters trees following Treatment Prescription 2 may be used to facilitate burning operations. Brushing of roads, line construction and brush removal may be done as preparation for burning. In addition, within areas of heavy surface fuel concentration, piling and pile burning, or jackpot burning may be utilized to facilitate burning operations. The treatment goal is to follow up on the naturally ignited 2008 Back Fire to continue to develop a fire interval that restores and enhances the burned area's ecological function.

7.8 Treatment Prescription 7 - Riparian Reserve Management

Treatments within the identified protective buffers (e.g. Riparian Reserves, SMZs and other sensitive areas) would be undertaken to reduce stand density, enhance stand health, and decrease fuels. Thinning would increase the resiliency of the buffer to natural disturbance regimes, and this type of thinning is consistent with the ACS Objectives (BMP 1.19). The following prescription design features have been developed in response to RX 4 – Minimal Management (LRMP). Treatment Prescription 7 contains protection measure specific to the riparian reserves associated treatment areas within treatment prescriptions 1-6 as follows:

7.8.1 Treatment Prescription 1, 2 4, 5, and 6 will follow prescription guidelines with the addition of the following:

- Vegetation that is designated for treatment within the SMZ would either be removed in the thinning operation or hand piled for burning (BMPs 1.19, 1.22, 1.6, and 1.8). Not burning hand piles or no treatment within the SMZ is permissible if fuels objectives are still attained.

- Prescribed burning would be conducted within Riparian Reserves and SMZ areas, but active ignition are prohibited within the SMZs. Burning may "back down" into the RRs and SMZs; however, fire would be suppressed if intensity is such that riparian vegetation or overstory canopy mortality would occur.

    - **Exception-** No ignition will be allowed within 300 feet of the fish-bearing reaches of Benmore Creek and Bucknell Creek.

- On slopes <40%, no hand pile burning would occur within 25 feet of the channel high water line.

    - ***Exception*** – hand piles may be located within 10-25 feet of the channel high water line if there is a topographic break (flat or bench with slope <20%). During burning, fire would not be allowed to creep outside the perimeter of the piled material, and the downhill perimeter of burn piles would remain unlit in order to retain some slash for ground cover and to function as a sediment trap.

- On slopes 40-60%, no hand pile burning would occur within 25 feet of the high water line, and shall include the following requirements:

    - Piling should utilize topographic features (flats, benches, or areas of least slope (10-20%), where available, to stabilize piles.

    - Slash should be piled with stems oriented with the slope to prevent rollout.

    - **Exception** – hand piles may be located within 10-25 feet of the channel high water line if there is a topographic break (flat or bench with slope <20%). During burning, fire would not be allowed to creep outside the perimeter of the piled material, and the downhill perimeter of burn piles would remain unlit in order to retain some slash for ground cover and to function as a sediment trap.

- On slopes >60%, slash may be lopped and scattered, and within the lower 10 feet of the SMZ the slash is to be moved upslope >10 feet from the channel high water line

7.8.2 Treatment prescription 3 will follow specific treatment prescription3 guidelines with the addition of the following:

- Within the outer portion of the riparian reserves, which is from the SMZ out to a total of 150 feet, the thinning prescriptions would be the same as the stand-specific prescriptions. Trees within the riparian reserve will be directionally felled in a manner to prevent impacts to stream banks.

- Within the inner portion of the riparian reserves referred to as the SMZ portion located from the high water line to 50 feet out only trees less than 10 inches DBH would be thinned from below on 15-25 foot spacing, with leave tree spacing dependent upon tree size and crown diameter.

- Retain all riparian obligate (near water dependent) vegetation, including within the RRs of seeps, springs, and unstable areas

- Tractor piling is not permitted within the RRs on slopes >25%; however, mastication or grapple piling is permissible within the RR, but outside of the SMZs on slopes <35%.

- Hand removal (with chainsaws or hand tools) of vegetation within the SMZ is allowed, with location and burning of piles to follow the SMZ guidelines below. Retain 70-75% of existing ground cover (litter/duff) in the SMZ.

- Retain canopy cover consistent with the unit prescription, with a minimum of 50% in intermittent and ephemeral SMZs, and 70% in perennial SMZs.

- On slopes of <50%, retain 70-75% of existing ground cover (litter/duff) in the SMZ, and 60-65% of existing ground cover (litter/duff/rocks) in the remainder of the riparian reserve.

- On slopes >50%, retain 70-75% of existing ground cover (litter/duff/rocks) in the entire riparian reserve.

- Cover bare soil areas that exceed 50 square feet with mulch or slash, at the ground cover level appropriate for the slope class, if the area is likely to deliver sediment to a stream.

8.0 Direct and Indirect Effects to Vegetation Treatment Level

8.1 Treatment Prescription 1 - Ecological Fuel Reduction Treatment Plantations Areas

8.1.1 Treatment Prescription 1 Existing Conditions

Prescription 1 was developed to treat conifer plantations to break up fuel continuity to permit future under burning and to promote habitat enhancement. The plantations are overstocked, creating conditions that contribute to tree growth and vigor impacts, which lead to an increasing susceptibility to insect and disease impacts. Trees per acre quantity represent values that lead to slower stand development through the successional stages. In addition, tree density is a factor that contributes to wildfire intensity and limits or prohibits successful prescribed fire application.

8.1.2 Vegetative Cover, Successional Stage, Structure, Diameter Size Class, Stand Density and Acreage

Table 11: Plantation Existing Conditions and Desired Future Conditions

Table 11 Unit	Year Planted	Acres	LSR Acres	Matrix Acres	Planted Spacing	Planted Number Trees Per Acre	Treatment Spacing	Treatment Number Trees Per Acre
40	1988	36	32	4	7x14	444	15' to 30'	48-194
41	1990	37	26	11	6x6	1210	15' to 30'	48-194
43	1992	13	13	0	6x6	1210	15' to 30'	48-194
44	1988	14	14	0	7x14	444	15' to 30'	48-194
45	1988	17	17	0	7x14	444	15' to 30'	48-194
46	1996	32	32	0	6x6	1210	15' to 30'	48-194
47	1989	13	13	0	6x6	1210	15' to 30'	48-194
48	1988	4	4	0	7x14	444	15' to 30'	48-194
49	1989	5	5	0	6x6	1210	15' to 30'	48-194
50	1988	8	8	0	7x14	444	15' to 30'	48-194
51	1988	5	5	0	6x6	1210	15' to 30'	48-194
52	1990	9	9	0	6x6	1210	15' to 30'	48-194
53	1985	28	28	0	7x14	444	15' to 30'	48-194
54	1986	17	17	0	7x14	444	15' to 30'	48-194
55	1986	17	17	0	7x14	444	15' to 30'	48-194
56	1985	19	19	0	7x14	444	15' to 30'	48-194
57	1986	2	2	0	7x14	444	15' to 30'	48-194

Table 11 Unit	Year Planted	Acres	LSR Acres	Matrix Acres	Planted Spacing	Planted Number Trees Per Acre	Treatment Spacing	Treatment Number Trees Per Acre
58	1986	11	12	0	7x14	444	15' to 30'	48-194
59	1988	5	5	0	7x14	444	15' to 30'	48-194
60	1981	10	10	0	7x14	444	15' to 30'	48-194
61	1986	9	9	0	7x14	444	15' to 30'	48-194
62	1986	6	7	0	7x14	444	15' to 30'	48-194
63	1981	47	47	0	7x14	444	15' to 30'	48-194

Plantation Vegetative Cover: Plantations were planted with either Douglas-fir, ponderosa pine trees or a combination thereof. Plantations upland and riparian areas are densely stocked with trees and minor amounts of shrub species. Current stocking conditions are contributing to heavy fuel loading and inter tree site resource competition. Black oak or madrone hardwood tree species have established through natural regeneration. Hardwood component is also affected by inter-tree competition. Dominate shrub species include chamise, manzanita and various ceanothus species.

Table 12Plantation Vegetation Cover

Table 12 Unit	Vegetation Type							Total Acres
	Closed-Cone Pine-Cypress	Douglas Fir	Mixed Chaparral	Montane Hardwood-Conifer	Montane Hardwood	Ponderosa Pine	Sierran Mixed Conifer	
40		18	3	15				36
41		8					29	37
43							13	13
44		13		1				14
45			2				15	17
46							32	32
47						13		13
48		4						4
49						5		5
50							8	8
51							5	5
52						8		8
53			14			14		28
54							17	17
55						17		17
56						19		19
57						2		2
58							11	11

Table 12 Unit	Vegetation Type							Total Acres
	Closed-Cone Pine-Cypress	Douglas Fir	Mixed Chaparral	Montane Hardwood-Conifer	Montane Hardwood	Ponderosa Pine	Sierran Mixed Conifer	
59						5		5
60			5			5		10
61			4			5		9
62			3			4		7
63	2	1					44	47
Total Acres	2	44	31	16	0	97	174	364

Diameter Size Class: Plantation tree diameters range between 4 -12 inches.

Stand Density: Average total canopy cover ranges between 50 to 80 percent. The average number of treeS ranges from approximately 400 to 1200 trees per acre. Planted tree spacing varied. Tree planting occurred at 6 feet by 6 feet spacing grid or varied at 7 feet by 14 feet grid spacing.

Acreage: The plantations represent early and mid-seral stage coniferous vegetation. Treatment units consist of 364 acres.

Table 13Treatment Prescription 1 treatment Acres and Land Designation

Prescription	Land Designation			Total
	LSR Acres	Matrix Acres	Riparian Reserves Acres	
Plantation Thinning	292	13	59	364

Vegetation effects analysis will focus on issues related to vegetation habitat protection and enhancement (long-term forest health). Vegetation effect to vegetative cover type and seral stage conditions,diameter size class, stand density, activityfuels and acreage involved will be discussed. Existing conditions led to treatment Prescription 1 development.

Diameter Size Class: Plantation tree removal involves small diameter trees that range between 4 to 12 inches DBH. Treatment effects to diameter size class will be to emphasize retaining trees within upper end of the diameter range.

Stand Density: Thinning treatment effect will be a reduction in the average number trees per acre. Leave trees will vary within the range from 70 to 200 trees per acre. Conifer and hardwood tree species stand density would be changed to a variable spacing ranging from 15 to 30 feet. Treatment effect will be an overall increase in the average distance between trees. The stand

density treatment will have the effect of reducing completion for site resources to accelerate large tree development. Stand density reduction will improve stand vigor, and resistance to insect/disease. A reduction in ladder fuels and an increase in live crown heights would reduce the wildfire risk and impacts. The reduced density will decrease prescribed fire risk enabling more effective fire use.

Where prescribed fire is applied only minimal reduction in stand density will occur. The primary goal is associated with surface fuel reduction and reducing competing vegetation between trees.

The effect to average total upland canopy cover will be a change to a canopy cover that varies within the range of 40 to 60 percent. Riparian reserve tree spacing will also be 15 to 30 feet and canopy cover may also vary within the range of 40 to 60 percent. These canopy level standards will have the effect of maintaining shade cover to avert adverse site temperature effects.

Activity Fuel Treatment: The direct effect caused by thinning without activity fuel treatment is to increase wildfire hazard. (Agee and Skinner 2005). (Placeholder1) The treatment prescription proposes to apply fuel treatments as prescribed fire only or as a combination of prescribed burning, hand or mechanical density reduction (thinning), hand or mechanical piling, or chipping. Where treatment requires thinning and activity fuel are created prescribed fire will be used to abate post thinning activity fuels to maintain surface fuel desired condition. Prescribed fire may be applied as broadcast burning, pile burning or combined treatment.

Acreage: Acreage occupied by the present seral stage is not expected to change classifications. No direct seral stage change. The indirect effects to seral stage will occur over time as a result attributed to increased individual tree growth.

Conclusion: Treatment effects will provide habitat protection and enhancement through reduce stocking levels or reduction in surface fuelsin order to make plantation stands more resilient to disturbances like insects, disease, drought, and wildfire. Density reduction treatment effects will enable prescribed fire application. Treatment effects will reduce competition to increase growth rates to advance large tree development. Treatment effects will promote black oak retention to promote habitat diversity enhancement for cavity nesting and mast eating animals. Treatment effect will reduce surface and ladder fuel densities. Follow up activity fuel treatment will abate effects of treatment generated slash and debris.

8.2 Treatment Prescription 2 - Ecological Fuel Reduction Treatment -- Naturally Forested Areas

8.2.1 Treatment Prescription 2 Existing Conditions

Prescription 2 was developed to promote or sustain late successional habitat within Naturally Forested Areas and adjacent vegetation types to address vegetation densities on the lower slopes to near watercourse areas where a commercial treatment was considered not feasible based on topography, slope, or late successional habitat sensitivy. The treatments are designed to break up fuel continuity to permit future under burning and to promote habitat enhancement. Naturally Forested Areas are overstocked, creating conditions that impede late successional habitat quality and development. Contribute to tree growth and vigor impacts, which lead to an increasing susceptibility to insect and disease impacts. The Natural stands high densities of trees less than or equal to 10 inches DBH contribute to high ladder fuel

concentrations. Mortality in the natural stands lower story component is contributing to excessive surface fuel buildup a factor that contributes to wildfire intensity and limits or prohibits successful prescribed fire application. Pictures below are representative of ladder fuel and surface fuel existing conditions.

Figure 14 Ladder fuel mortality leading to high surface fuel concentrations

Figure 15 Lower story Ladder fuels extending into upper story trees

Figure 16 Typical Ladder fuel structure

8.2.2 Vegetative Cover, Successional Stage, Structure, Diameter Size Class, Stand Density and Acreage

8.2.3 Existing Vegetative Cover and Successional Stage and Treatment effects

Prescription 2 treatment areas largest vegetation type is expressed as a "Sierra mixed conifer stand type"(SMC) 2056 acres. This type is generally described as stands with as many as three different commercial conifer species, but may have as few as two of these species as canopy co-dominants. Minimum conifer species composition consists of at least ten percent. Stands are usually characterized by a combination of Douglas-fir ponderosa pine, and sugar pine. Associated common hardwood species are black oak, canyon live oak, and madrone. Some areas may express a Douglas-fir or ponderosa pine type dominance. In addition to SMC vegetation types, ten other vegetation types fall under this prescription treatment. The other types are associated with some of the treatment units as transitional types between dense coniferous forests, montane hardwood, mixed chaparral, or open woodlands and savannahs.Refer to Table 14 CWHR Vegetation Types Treatment Prescription 2 Acreage

Prescription 2 treatment units consist of mixture of the following California Wildlife Habitat Relationship system vegetation types. The treatment units Forested areas express components of early, mid, late to mature seral stages, and the Chaparral areas express decadent seral stage. No seral stage was applied to Annual Grass Land. Refer to **Table 14 Existing CWHR Forest Vegetation Types & Seral Stages Treatment Prescription 2.**

Table 14--Existing CWHR Vegetation Types & Seral Stage Treatment Prescription 2 Acreage

Table 14	CWHR Vegetation Type											
Unit Number Seral Stage[1]	Annual Grass Land	Coastal Oak Woodland	Closed Cone Pine	Chemise redshank Chaparral	Douglas fir	Mixed Chaparral	Montane Chaparral	Montane Hardwood Conifer	Montane Hardwood	Ponderosa Pine	Sierran Mixed Conifer	Total Acres
64		**9**			**15**			**21**	**15**		**69**	**129**
Early		9			12			7	14		12	54
Mid								2			1	3
Mature								1			12	12
Late					3			11	1		45	60
65	**17**				**3**	**24**	**3**	**183**	**81**	**40**	**562**	**914**
Early						0			0	0	54	54
Mid					3			162	51	5	147	369
Mature								8	25	13	159	205
Late								12	5	22	202	241
Decadent	17					24	3					45
66						**3**		**9**	**16**	**12**	**137**	**177**
Early						3		9	16	12	58	99
Mid											2	2
Mature										0	17	17
Late											60	60
67						**1**	**0**	**6**	**19**	**1**	**31**	**58**
Early						0			8	1	9	19
Mid									0		3	3
Mature									6	0	11	18
Late								6	4		8	19
Decadent						0	0					1
68	**6**			**3**	**38**	**14**		**124**	**134**	**5**	**79**	**403**
Mid								7	81			87
Mature								0	30			30
Late					38			117	13	5	79	252
Decadent	6			3		14						23
69	**5**							**22**	**7**		**190**	**224**
Early								15	7		7	29
Mid								7	0		10	17
Mature											28	28

Table 14	CWHR Vegetation Type											
Unit Number Seral Stage[1]	**Annual Grass Land**	**Coastal Oak Woodland**	**Closed Cone Pine**	**Chemise redshank Chaparral**	**Douglas fir**	**Mixed Chaparral**	**Montane Chaparral**	**Montane Hardwood Conifer**	**Montane Hardwood**	**Ponderosa Pine**	**Sierran Mixed Conifer**	**Total Acres**
Late											145	145
N/A	5											5
70					**0**			**0**	**3**			**3**
Early					0			0				0
Mid									0			0
Mature									2			2
71									**1**		**36**	**37**
Mid											0	0
Mature									1		19	19
Late											17	17
72											**16**	**16**
Late											16	16
73								**0**			**137**	**137**
Mid								0			0	0
Mature								0			57	57
Late											67	67
74								**2**		**26**	**35**	**63**
Early										26	21	47
Mid											8	8
Mature											4	4
Late								2			2	4
75	**9**				**8**	**89**	**22**	**11**	**46**	**2**	**59**	**246**
Early						0			0	0	4	5
Mid					8				34		16	57
Mature								10	12	2	10	34
Late								1	0		29	30
	9					89	22					119
76				**8**	**6**	**14**		**0**	**9**	**5**	**89**	**131**
Early									0	0	0	1
Mid									2		28	30
Mature								0		4	51	55
Late					6			0	6	1	10	22
Decadent				8		14						22

Table 14	CWHR Vegetation Type											
Unit Number Seral Stage[1]	**Annual Grass Land**	**Coastal Oak Woodland**	**Closed Cone Pine**	**Chemise redshank Chaparral**	**Douglas fir**	**Mixed Chaparral**	**Montane Chaparral**	**Montane Hardwood Conifer**	**Montane Hardwood**	**Ponderosa Pine**	**Sierran Mixed Conifer**	**Total Acres**
78										**4**	**19**	**23**
Early										4	8	13
Mid											0	0
Mature											1	1
Late											10	10
80						**2**		**2**	**0**		**38**	**41**
Early								2	0			2
Mid											4	4
Mature											12	12
Late											22	22
Decadent						2						2
81					**8**			**10**	**18**	**3**	**50**	**89**
Early								3	18	0	4	25
Mid								1				1
Mature					1					3	3	8
Late					6			6			43	55
82								**0**		**0**	**15**	**15**
Early								0		0	9	10
Mature											3	3
Late											0	0
83					**5**				**0**	**0**	**66**	**71**
Early					1				0	0	6	8
Mid					2						11	13
Mature					2						33	35
Late											16	16
84										**0**	**40**	**40**
Early										0		0
Mid											15	15
Mature											1	1
Late											23	23
85			**13**		**19**	**56**		**15**	**21**		**1**	**125**
Early					13	1		0				14
Mid									13			13

Table 14	CWHR Vegetation Type											
Unit Number Seral Stage[1]	Annual Grass Land	Coastal Oak Woodland	Closed Cone Pine	Chemise redshank Chaparral	Douglas fir	Mixed Chaparral	Montane Chaparral	Montane Hardwood Conifer	Montane Hardwood	Ponderosa Pine	Sierran Mixed Conifer	Total Acres
Mature			9					15	3			26
Late			4		6				5		1	17
Decadent						54						54
87					**15**		**2**	**39**	**29**	**21**	**142**	**249**
Early								16	22	20	38	97
Mid								24			19	42
Mature					2					0	27	30
Late					13				7		61	81
Decadent							2					2
90					**27**	**4**		**7**	**25**	**23**	**246**	**333**
Early									21	23	0	45
Mid									0			0
Mature									1		1	2
Late					27			7	3		245	282
Decadent						4						4
Grand Total	**38**	**9**	**13**	**11**	**145**	**206**	**27**	**452**	**423**	**144**	**2056**	**3523**

[1]No seral stage determined for Annual Grass Land

Diameter Size Class: Existing Stand Conditions reflect a size class distribution that represents high densities of trees less than 10 inches DBH. Data collected for the Treatment Prescription indicates that trees per acre 10 inches DBH or less range is 0 to 1518. Trees per acre 10 inches DBH or greater range is 43 to 226 trees per acre. Based on field observations these values are considered reflective for the units making up this treatment area.

Stand Density: Average total canopy cover ranges between 50 to 90 percent. Tree densities are very high, ranging from minimum of 65 to a maximum greater than 1600 trees per acre. The average number of trees per acre equals 500 trees per acre which correlates to an average spacing of 9 feet between trees.

This high density is due to the establishment of young conifer trees underneath the residual overstory trees. The extensive ladder fuel concentrations impede wildlife habitat. The declining understory tree vigor is contributing to increased tree mortalitythat is also developing high surface fuel loads all contributing to increased fire hazard conditions.

Table 15Treatment Prescription 2 Treatment Acres and Land Designation

Treatment Prescriptions	Land Designation				Total Acres
	LSR Acres	Matrix Acres	RR Acres LSR	RR Acres Matrix	
Treatment Prescription 2 - Ecological Fuel Reduction Treatment -- Naturally Forested Areas	2797	726	1849	385	3523

Vegetation effects analysis will focus on issues related to vegetation habitat protection and enhancement (long-term forest health and Wildlife Habitat). Vegetation effect to vegetative cover type and seral stage conditions, diameter size class, stand density, activity fuels and acreage involved will be discussed. Existing conditions led to treatment Prescription 2 development.

8.2.4 Effects Vegetative Cover Type, Successional Stage, Diameter Size Class, Stand Density, Activity Fuel Conditions and Acreage

Natural Forested Area Vegetative Cover Type and Successional Stage: Ecological fuel reduction will have the effect of reducing surface fuels and ladder fuels.There are no direct effects to vegetation cover type. The cover type will remain the same. Treatment effect will provide a post treatment canopy cover range within 50 to 80 percent. The treatment effect to perennial riparian reserve canopy cover will be to maintain at least 60 percent cover, and the stream side management zone canopy cover will be retained at a minimum 70 percent cover. The canopy retention level will have the effect of minimizing or negate changes to evaporation rates or water temperatures. Refer to the Hydrologist report for more detailed discussion concerning evaporation rates and water temperature.

The indirect effect will be a reduced vegetation density. The current successional stage would not change. The effect from the density management treatment will serve to protect and enhance the structural habitat characteristics attributed to the large tree component. Treatment will reduce the number of understory trees contributing to ladder fuel concentrationsmaking the treatment area less susceptible to crown fire within the upper-story trees.Treatment effect will reduce the number of trees to provide for reduced competition between residual trees to assist successional stage development. The treatment effect will serve to enhance plant community health and biodiversity.

Diameter Size Class: The natural stands contain large diameter conifer and hardwood trees over dense conifer reproduction and or brush. No effects to the upper story large diameter conifer and hardwood trees. Prescription 2 treatment primarily involves lower story tree removal within the DBH ranges of 4 to less 10 inches. Treatments effects to the lower story trees will be an emphasis to retain trees within upper end of the diameter size class.

Stand Density: Prescription 2 treatment would have a direct effect to stand density by the reduction in lower story tree density. The effect to conifer and hardwood tree species would be increased spacing range to 15 to 25 feet based on measurement taken from the larger diameter upper story trees. Lower story conifer trees with the potential to interfere with black oak canopies will be removed. The treatment effect to black oak trees will serve to enhance plant community health and biodiversity.

Prescribed burning may include various types of burning such as pile burning, understory burning and jackpot burning. Prescribed fire may be applied as pre-thinning prescribed burning, post-thinning prescribed burning, or as prescribed burning only.

Where prescribed fire is applied the effects only minimal reduction in stand density will occur. The primary effect is surface fuel reduction. Because of the low fire intensity required to limit impacts, treatment will result in only a minor reduction is small diameter trees. Prescribe fire treatment only effect will result in prescribed fire requiring several entries to achieve desired conditions.

Activity Fuel Treatment: The direct effect caused by thinning without activity fuel treatment is to increase wildfire hazard. (Agee and Skinner 2005). The treatment prescription proposes to apply fuel treatments as prescribed fire only or as a combination of prescribed burning, hand or mechanical density reduction (thinning), hand or mechanical piling, or chipping. Where treatment requires thinning and activity fuel are created prescribed fire will be used to abate post thinning activity fuels to maintain surface fuel desired condition. Prescribed fire may be applied as broadcast burning, pile burning or combined treatment.

Acreage: Acreage occupied by the present seral stage is not expected to change classifications. No direct seral stage change. The indirect effects to seral stage will occur over time as a result attributed to increased individual tree growth.

Conclusion: Treatment effects will provide habitat protection and enhancement through reduce stocking levels or reduction in surface fuels in order to make stands more resilient to disturbances like insects, disease, drought, and wildfire. Density reduction treatment effects will enable prescribed fire application. Treatment effects will reduce competition to increase growth rates to advance large tree development. Treatment effects will promote black oak retention to promote habitat diversity enhancement for cavity nesting and mast eating animals. Treatment effects will reduce surface and ladder fuel densities. Follow up activity fuel treatment will abate effects of treatment generated slash and debris.

8.3 Treatment Prescription 3 – Ecological Fuel Reduction Treatment -- Commercial Thinning

Applied ecological thinning treatments aim to enhance biodiversity through focusing tree retention on leave trees that provide habitat with structural diversity more suitable to late successional species. Ecological enhancement thinning addresses appropriate tree density reduction to open the lower story canopy to enhance NSO / late-successional habitat, reduce inter-tree competition and develop resiliency.

8.3.1 Treatment Prescription 3 Existing Conditions,Direct and Indirect Effects Analysis

Prescription 3 was developed to promote or sustain late successional habitat by working within current stand heterogeneity. The current heterogeneity is expressed in the variable density found in stand structure as related to tree size distribution, stem spatial patterns, species composition and stand dynamic processes (growth, mortality and regeneration). Ecological enhancement thinning will incorporate the intermediate silvicultural practice thinning from below combined with certain aspects of variable density thinning.

Thinning treatment will reduce stand density to improve growth and yield, enhance stand health, and reduce potential mortality. More specifically thinning from below is the removal of trees primarily from the lower crown classes to favor those in the upper crown classes. Thinning reduces competition between trees for onsite resources such as light, water, and nutrients. Stand density varies, but stands selected for thinning are typically well stocked or overstocked and have sufficient density to respond to thinning treatment.

8.3.2 Vegetative Cover, Successional Stage, Species Composition,Habitat Structural Analysis

8.3.3 Treatment effects Existing Vegetative Cover and Successional Stage

Prescription 3 treatment areas overall conifer vegetation type is expressed as a "Sierra mixed conifer stand type". This type is generally described as stands with as many as three different commercial conifer species, but may have as few as two of these species as canopy co-dominants. Minimum conifer species composition consists of at least ten percent. Stands are usually characterized by a combination of Douglas-fir, ponderosa pine, and sugar pine. Associated common hardwood species are black oak, canyon live oak, and madrone. Some areas may express a Douglas-fir or ponderosa pine type dominance. In addition to conifer dominated vegetation types, the Montane Hardwood-Conifer type is associated with some of the treatment units as a transitional type between dense coniferous forests and montane hardwood, mixed chaparral, or open woodlands and savannahs.

Prescription 3 treatment units consist of mixture ofthe following California Wildlife Habitat Relationship system vegetation types. The treatment units express components of early, mid, late to mature seral stages and early, mid, late successional stages. The existing conditions seral and successional stages in terms of acreage present is represented as mid seral or mid successional stage. Refer to **Table 16 Existing Commercial Treatment Units CWHR Forest Vegetation Types & Seral Stages.**

Table 16Existing Commercial Units CWHR Forest Vegetation Types & Seral Stages.

Table 16	Unit Acres	CWHR Vegetation Type								Seral Stage Acres				Successional Stage			
										Early	Mid	Late	Mature	Early	Mid	Late	Total Acres
Unit		COW	DFR	MCH	MCP	MHC	MHW	PPN	SMC								
3A	12								12				12			12	12
3B	24								24				24			24	24
4	86					1	4		81		85		1		85	1	86
5	29					9	9		11	1	28			1	28		29
6	113					1	7	7	98	2	29		82	2	29	82	113
7	77								77		77				77		77
8	131	1	1			3	1		125	3	128			3	128		131
9	16		15						1	1	15			1	15		16
12	32								32		32				32		32
13	59		1			9	5		44		59				59		59
14	91					4		4	83	1	90			1	90		91
15	107					7		4	96	2	105			2	105		107
16	59								59		59				59		59
17	57						6	4	47	4			53	4		53	57
18	133					14	17	37	65		17		116		17	116	133
19	20						1		19	4			16	4		16	20
21	23		3						20				23			23	23
22	19								19				19			19	19
23	48			1			17		30				48			48	48
24A	14		1						13		14				14		14
24B	9								9		9				9		9
24C	25		1					7	17				25			25	25
24D	21		7					12	2		21				21		21

Table 16 Unit	Unit Acres	CWHR Vegetation Type								Seral Stage Acres				Successional Stage			
										Early	Mid	Late	Mature	Early	Mid	Late	Total Acres
		COW	DFR	MCH	MCP	MHC	MHW	PPN	SMC								
25	12						9		3				12			12	12
26	57							2	55	2			55	2		55	57
27	17								17		17				17		17
28	11							11					11			11	11
29	38							24	14				38			38	38
30	10								10		10				10		10
31	24							1	23				24			24	24
32	45								45				45			45	45
33A	10								10				10			10	10
33B	18								18		18				18		18
34	11								11				11			11	11
35	36								36				36			36	36
37	143							1	142	1	142			1	142		143
38	5								5				5			5	5
39	59								59		59				59		59

*California Wildlife Habitat Relationship

Prescription 3 treatment will have the effect of changing the dominance of seral stages. Currently, nineteen units represent mid seral or mid successional stage and nineteen are present as mature seral or late successional. The treatment effect will enhance the seral and successional stages through density reduction of smaller diameter trees.The seral and successional stage of nineteen units currently classified as mature seral or late successional will remain the same, but other nineteen units seral and successional stages will change post treatment to mature seral and late successional stage. Refer to **Table 17Post Treatment Commercial Units CWHR Vegetation Types and Seral Stages** for the post treatment seral and successional stages. Refer to **Table 18 Seral and Successional stage Acreage Change.**

The treatment effect will move 1014 acres that as a result of excessive small diameter tree densities express mid seral stage habitat to densities consisting a dominance of larger diameter trees that will express mature seral stage habitat.

Table 17 Post Treatment Commercial Units CWHR* Vegetation Types and Seral Stages

Table 17 Unit	Unit Acres	CWHR Vegetation Type								Seral Stage Acres				Successional Stages			Total Acres
		COW	DFR	MCH	MCP	MHC	MHW	PPN	SMC	Early	Mid	Late	Mature	Early	Mid	Late	
3A	12								12				12			12	12
3B	24								24				24			24	24
4	86					1	4		81				86			86	86
5	29					9	9		11	1			28	1		28	29
6	113					1	7	7	98	2		7	104	2		111	113
7	77								77				77			77	77
8	131	1	1			3	1		125	3			128	3		128	131
9	16		15						1	1			15	1		15	16
12	32								32				32			32	32
13	59		1			9	5		44				59			59	59
14	91					4		4	83	1			90	1		90	91
15	107					7		4	96	2			105	2		105	107
16	59								59				59			59	59
17	57						6	4	47	4			53	4		53	57
18	133					14	17	37	65			17	116		17	116	133
19	20						1		19	4			16	4		16	20
21	23		3						20				23			23	23
22	19								19				19			19	19
23	48			1			17		30				48			48	48
24A	14		1						13				14			14	14

Table 17 Unit	Unit Acres	CWHR Vegetation Type								Seral Stage Acres				Successional Stages			Total Acres
		COW	DFR	MCH	MCP	MHC	MHW	PPN	SMC	Early	Mid	Late	Mature	Early	Mid	Late	
24B	9								9				9			9	9
24C	25		1					7	17				25			25	25
24D	21		7					12	2				21			21	21
25	12						9		3				12			12	12
26	57							2	55	2			55	2		55	57
27	17								17				17			17	17
28	11							11					11			11	11
29	38							24	14				38			38	38
30	10								10				10			10	10
31	24							1	23				24			24	24
32	45								45				45			45	45
33A	10								10				10			10	10
33B	18								18				18			18	18
34	11								11				11			11	11
35	36								36				36			36	36
37	143							1	142	1			142	1		142	143
38	5								5				5			5	5
39	59								59				59			59	59

TREATMENT EFFECTS
Seral / Successional Stage Enhanced
No Change in Seral / Successional Stage

Table 18Seral and Successional stage Acreage Change.

Unit	Total Unit Acres	CWHR Vegetation Type								Seral Stage Acres				Successional Stage			
										Early	Mid	Late	Mature	Early	Mid	Late	Total Acres
		COW	DFR	MCH	MCP	MHC	MHW	PPN	SMC								
Existing Conditions																	
Total	1701	1	29	1		48	76	114	1432	21	1014	0	666	21	1014	666	1701
Post Treatment Conditions																	
Total	1701	1	29	1		48	76	114	1432	**21**	**0**	**24**	**1656**	**21**	**17**	**1663**	1701
						Seral and Successional stage change				**21**	**0**	**24**	**+1014**	**21**	**17**	**+997**	

TREATMENT EFFECTS
Seral / Successional Stage Enhanced
No Change in Seral / Successional Stage

8.3.4 Species Composition

No pure old growth stands as defined in Potter et al. 1992 were found in these units. However, treatment unit stand structure includes two or sometimes three storied stands that contain a remnant old growth component expressed as scattered single trees or found in a group clumplike distribution.

Field observations indicate that the general conifer tree distribution is consistent over the treatment area, but hardwood distribution tends to occur as individual trees or concentrated groups ranging from one half acre to five acres. Hardwoods along with the larger remnant conifers contribute to late seral structural habitat elements such as large branches, cavities and other structures suitable for nesting, denning and resting habitat for late successional wildlife. The larger diameter hardwood treeswhich express healthy, large vigorous crowns provide vertical stand diversity, browse, mast and prey for wildlife species; contributing to functional habitat for goshawks, fishers and NSO. In response to the presence of concentrated hardwood groups, hardwood retention group areas shall be established.

The current species distribution percentages indicate that 66 percent of the forested treatment area is Douglas-fir, 9 percent ponderosa pine, 12 percent sugar pine and 13 percent hardwoods.Post treatment molded effects yield species distribution percentages that indicated a decrease in Douglas-fir percentages and an increase in ponderosa, sugar pine and hardwoods. Refer to **Table 19Species Composition Existing and Post Treatmen**t for comparison of species composition expressed in term of percent basal area (BA).

Table 19Species Composition Existing and Post Treatment

Table 19 Unit	Acres	Existing Basal Area % Species Composition					Post Treatment Basal Area % Species Composition				
		DF	PP	SP	BO	MA	DF	PP	SP	BO	MA
3A	12	72	10	0	18	0	70	11	0	19	0
3B	24	67	9	0	25	0	62	10	0	28	0
4	86	65	13	1	21	0	56	14	2	28	0
5	29	91	0	0	9	0	86	0	0	14	0
6	113	58	25	2	15	0	51	25	2	23	0
7	77	46	7	27	15	6	29	0	36	25	11
8	131	66	12	3	11	8	70	0	5	14	11
9	16	100	0	0	0	0	100	0	0	0	0
12	32	57	9	18	16	0	36	0	35	30	0
13	59	55	11	8	26	0	45	14	10	32	0
14	91	68	10	3	19	0	56	11	3	29	0
15	107	79	10	11	0	0	78	4	18	0	0

Table 19 Unit	Acres	Existing Basal Area % Species Composition					Post Treatment Basal Area % Species Composition				
		DF	PP	SP	BO	MA	DF	PP	SP	BO	MA
16	59	61	22	13	4	0	29	54	6	11	0
17	57	87	7	0	7	0	87	8	0	5	0
18	133	66	20	3	11	0	67	9	5	19	0
19	20	96	0	0	4	0	95	0	0	5	0
21	23	69	0	31	0	0	47	0	53	0	0
22	19	85	0	15	0	0	82	0	18	0	0
23	48	61	12	0	23	4	48	17	0	30	5
24A	14	43	14	30	13	0	27	21	29	23	0
24B	9	55	21	22	2	0	43	18	37	3	0
24C	25	70	10	11	9	0	65	9	10	16	0
24D	21	43	14	30	13	0	27	21	29	23	0
25	12	58	0	0	42	0	56	0	0	44	0
26	57	55	21	22	2	0	43	18	37	3	0
27	17	48	16	30	0	6	32	21	36	0	11
28	11	73	4	10	8	4	59	0	20	14	7
29	38	73	3	3	21	0	51	5	6	39	0
30	10	36	5	36	10	13	23	4	40	14	19
31	24	51	28	15	0	7	31	37	22	0	10
32	45	49	15	21	5	10	29	21	30	7	13
33A	10	64	0	12	23	0	61	0	14	25	0
33B	18	61	7	14	18	0	59	7	15	19	0
34	11	46	6	38	5	5	52	8	25	7	7
35	36	93	0	0	7	0	90	0	0	10	0
37	143	73	3	14	8	3	59	3	21	13	4
38	5	83	0	0	17	0	72	0	0	28	0
39	59	69	0	25	6	0	69	0	25	6	0
Ave		66	9	12	11	2	56	10	15	16	3
Max		100	31	35	40	16	100	54	53	44	19
Min		35	0	0	0	0	23	0	0	0	0

8.3.5 Habitat Structural AnalysisTrees Per Acre-Diameter Size Class, Stand Density Index, Basal Area, Canopy Cover, Quadratic Mean Diameter, and Trees Greater Than or Equal to 26 Inches DBH.

The following effects analysis will focus on habitat structural analysis comparing existing conditions to desired conditions. In addition, to LRMP and LSRA desired condition, guidance direction was pursued from the USF&W concerning NSO habitat desired condition. USF&W suggested following their directions to private timberland in California's Northern Interior Region where the Pine Mountain Project is located. This document titled "Regulatory and Scientific Basis for U.S. Fish and Wildlife Service Guidance for Evaluation of Take for Northern Spotted Owls on Private Timberlands in California's Northern Interior Region"(USF&W 2008) contains stand metrics needed to avoid habitat impact which would lead to NSO take situation. Table 9 in section 4.2 presents the minimum requirements for Take Avoidance. These habitat requirement will serve to guide NSO effects analysis. Additional stand metrics are also presented to clarify tree density distribution and species composition.

8.3.6 Trees per Acre-Diameter Size ClassIndicator:

Treatment effects have been evaluated utilizing the following diameter size classes: Total Existing Trees per Acre, Existing Trees per Acre Less than 10" DBH and Existing Trees per Acre Greater than 10" DBH compared to Post treatment values in each diameter size class.

Existing Stand Conditions reflect a size class distribution that represents high densities of trees less than 10 inches DBH. Trees per acre 10 inches DBH or less range is 0 to 1518. Trees per acre 10 inches DBH or greater range is 43 to 226 trees per acre. Refer to **Table 20Existing Trees per Acre Diameter Size Class** for unit specific values. Number values represent conifer and hardwood species.

Table 20 Existing Trees per Acre Diameter Size Class

Table 20 Unit	Unit Acres	Total Existing Trees per acre	Existing Trees per Acre Greater than 10" DBH	Existing Trees per Acre Less than 10" DBH	Total post treatment Trees per acre	Post Treatment Trees per Acre Greater than 10" DBH	Total Post Treatment Trees per Acre Less than 10" DBH
3A	12	241	82	159	83	66	17
3B	24	231	78	152	70	49	21
4	86	341	91	250	102	40	62
5	29	579	116	463	141	28	113
6	113	380	97	283	47	47	0
7	77	1514	114	1399	161	50	110
8	131	1162	108	1054	105	74	31
9	16	770	43	727	170	28	142
12	32	1619	101	1518	41	41	0
13	59	498	86	412	167	62	105
14	91	460	109	351	45	45	0
15	107	381	115	266	46	46	0
16	59	952	143	809	73	29	44
17	57	122	99	23	34	34	0

Table 20 Unit	Unit Acres	Total Existing Trees per acre	Existing Trees per Acre Greater than 10" DBH	Existing Trees per Acre Less than 10" DBH	Total post treatment Trees per acre	Post Treatment Trees per Acre Greater than 10" DBH	Total Post Treatment Trees per Acre Less than 10" DBH
18	133	429	124	305	37	37	0
19	20	144	84	60	77	77	0
21	23	65	65	0	17	17	0
22	19	395	87	308	89	22	67
23	48	884	156	728	478	90	388
24A	14	1005	94	911	107	24	83
24B	9	553	93	459	71	32	39
24C	25	362	87	275	48	25	23
24D	21	1005	94	911	107	24	83
25	12	179	85	94	75	75	0
26	57	112	92	20	35	35	0
27	17	436	132	303	67	45	22
28	11	206	179	27	69	69	0
29	38	466	226	240	126	113	13
30	10	476	105	371	137	68	69
31	24	174	99	75	46	46	0
32	45	204	91	113	50	41	10
33A	10	188	60	128	132	59	73
33B	18	820	98	721	175	95	80
34	11	127	92	35	48	48	0
35	36	252	96	156	60	60	0
37	143	471	92	379	190	36	154
38	5	175	119	56	88	88	0
39	59	634	65	569	168	30	138
Average		500	103	398	100	50	50
Max		1619	226	1518	478	113	388
Min		65	43	0	17	17	0

8.3.7 USF&W Trees Greater Than or Equal to 26 Inches DBH per acre Indicator:

Calculation to assess tree distribution changes, were performed to determine the retention quantity for trees greater than or equal to 26 inches DBH.Table 21 Nesting, Table 22 Foraging and Table 23 Dispersal presents the existing condition indicator values and post treatment and future conditions indicator values modeled by FVS.

Table 21: Nesting Trees Greater Than or Equal to 26 Inches DBHper Acre

TPA≥26	ACRES PER UNIT	Existing Condition	Post Treatment	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	
3A	12	17	18	21	21	21	22	26	26	30	29	27	24	22	20	160
19	20	34	34	34	33	32	32	31	30	29	28	28	31	32	30	240
24B	9	44	32	32	32	32	32	32	32	31	31	30	30	29	28	160
33B	18	12	13	15	15	19	20	23	24	27	28	27	28	27	24	160

Three out of four meet USF&W nesting values.Nesting units 3A and 33B initial treatment effects enhance habitat increasing the number of trees greater than or equal to 26 inches DBH. Unit 19 remains the same, and Unit 24B treatment effect is within habitat range. Prescribed fire treatment effects assist to sustain initial treatment effects.

Table 22: Foraging Trees Greater Than or Equal to 26 Inches DBH per Acre

TPA≥ 26	ACRES PER UNIT	Existing Condition	Post Treatment	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	
3B	24	12	14	15	15	17	17	17	17	17	20	26	28	29	28	120
4	86	18	18	18	18	22	24	29	29	33	33	31	28	26	24	120
5	29	19	18	18	18	18	18	20	20	20	26	25	24	22	20	120
6	113	16	17	18	18	23	24	28	29	32	31	29	27	25	23	120
7	77	27	24	24	24	26	26	26	26	26	28	27	27	27	26	120
8	131	16	16	16	16	19	20	26	27	35	37	36	33	30	27	120
9	16	30	28	28	28	28	28	27	27	26	25	24	22	20	27	BA1 60
12	32	26	26	25	25	28	28	28	28	29	30	33	33	33	32	120
13	59	11	11	11	11	11	11	12	12	14	14	16	17	20	23	120
14	91	17	18	21	22	28	28	31	30	33	34	35	34	33	31	120
15	107	12	15	18	18	24	24	26	27	30	34	33	30	28	25	BA1 60
16	59	15	14	14	14	16	16	16	16	16	16	16	16	16	16	120
17	57	14	14	15	15	23	23	26	25	25	25	24	23	21	20	120
18	133	19	20	22	23	28	29	32	32	33	33	32	29	27	24	120
21	23	29	24	23	23	23	23	23	23	23	23	22	22	21	20	BA1

TPA≥ 26	ACRES PER UNIT	Existing Condition	Post Treatment	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	
																60
22	20	23	26	30	30	33	33	32	32	32	31	30	29	26	24	BA1 60
23	48	11	11	11	10	10	10	14	14	25	32	32	33	33	32	120
24C	25	29	25	25	24	24	24	24	24	24	23	22	21	20	18	120
25	12	11	11	11	11	21	24	34	33	37	35	32	29	26	24	120
26	57	18	19	24	25	30	30	30	31	30	29	28	28	26	24	BA1 60
27	17	12	12	13	14	22	25	30	30	31	31	30	27	25	23	120
28	11	16	16	16	16	20	20	28	28	33	33	32	29	27	25	120
29	38	4	4	4	4	11	11	17	18	27	41	49	48	44	41	120
30	10	11	13	15	16	20	20	25	25	29	29	27	25	23	22	120
33A	10	9	12	14	14	22	22	26	26	25	24	22	20	24	22	120
34	11	10	12	14	16	21	22	27	27	31	37	37	32	29	26	120
35	36	4	4	4	4	12	16	21	20	25	33	38	35	32	28	120
37	143	19	20	20	20	20	20	19	19	20	20	20	20	18	17	120
38	5	13	21	22	23	32	32	32	31	31	30	28	26	24	23	120
39	59	19	20	22	23	28	28	28	28	28	27	26	24	22	20	120

Two of the thirty unit existing condition values do not meet USW&F parameters, but treatment effect do not cause a change. Ten foraging units' treatment effects enhance habitat increasing the number of trees greater than or equal to 26 inches DBH. Fourteen units remains the same, and four units treatment effect is within habitat range.

Table 23: Dispersal Trees Greater Than or Equal to 26 Inches DBHper Acre

TPA≥ 26	ACRES PER UNIT	Existing Condition	Post Treatment	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	TPA ≥ 26	
24A	14	26	24	24	24	23	23	23	23	23	23	23	22	22	21	120
24D	21	26	24	24	24	23	23	23	23	23	23	23	22	22	21	120
31	24	12	13	14	15	21	22	31	31	34	35	35	35	32	29	120
32	45	18	22	22	24	25	25	25	25	29	29	28	26	24	23	120

All dispersal units' existing condition values meet the foraging parameters and three out of four meet nesting values. After treatment all meet nesting value. Dispersal units 31 and 18 treatment effects enhance habitat increasing the number of trees greater than or equal to 26 inches DBH. Unit 24A and 24D treatment effect are within habitat range. Prescribed fire treatment effects assist to sustain initial treatment effects.

8.3.8 USF&W Quadric Mean Diameter per acre indicator:

Quadratic Mean Diameter (QMD): Calculation to assess tree distribution were performed to determine the quadratic mean diameters (QMD).QMD is an expression of the diameter of the tree with the average basal area. Therefore, QMD gives greater weight to large trees. QMD may be equal to but is usually greater than the arithmetic mean (Curtis & Marshall 2000). QMD is also stable for modeling purposes, being better correlated to stand density and directly convertible to basal area. The Forest Vegetation Simulator (FVS) uses QMD in many equations. QMD is a stand attribute that is used to describe wildlife habitat. Refer to the wildlife specialist Biological Assessment/Biological Evaluation of Terrestrial Wildlife Species report for associated treatment effects.QMD is also a variable for calculating SDI.QMD combined with TPA also reflects the number of small diameter trees that may function as ladder fuels

Calculation to assess QMD changes, were performed to determine the effects toQMD. Table 24 Nesting, Table 25 Foraging and Table 26 Dispersal presents the existing condition indicator values and post treatment and future conditions indicator values modeled by FVS.

Table 24 Nesting QMD per Acre

QMD	ACRES PER UNIT	Existing Condition	Post Treatment	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Units	Acres	2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
		QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
3A	12	13	20	21	21	19	19	17	18	17	19	22	24	27	29	160
19	20	19	25	25	25	21	22	19	20	18	19	21	22	24	26	BA240
24B	9	10	23	23	22	18	19	17	17	15	16	17	18	19	20	160
33B	18	7	15	16	16	16	16	16	16	16	19	21	24	27	29	160

Only one units' existing condition meets USF&W values. After treatment all nesting units' treatment effects enhance habitat increasing the QMD within the range of nesting parameters.Resulting in treatment effects that are a greater reflection of late-successional habitat.Prescribed fire treatment effects assist to sustain initial treatment effects

Table 25 Foraging QMD per Acre

QMD	ACRES PER UNIT	Existing Condition	Post Treatment	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Units	Acres	2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
		QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
3B	24	12	19	20	20	17	17	15	16	14	15	16	17	18	19	120
4	86	11	18	18	18	16	16	15	16	15	16	17	18	20	22	120
5	29	9	14	14	14	13	13	12	13	12	13	14	15	17	19	120
6	113	11	25	26	26	19	20	17	18	16	17	19	21	22	24	120
7	77	6	15	15	15	14	14	13	14	13	14	15	16	17	18	120
8	131	6	17	18	18	16	16	15	15	14	16	17	19	21	24	120
9	16	7	13	14	14	13	13	13	13	13	13	14	16	18	19	BA160
12	32	6	28	29	29	21	21	18	19	17	17	18	19	20	21	120
13	59	9	14	14	14	13	13	13	13	12	13	14	15	16	17	120
14	91	10	26	27	27	20	21	17	18	16	18	19	20	22	24	120
15	107	11	25	26	27	20	21	18	19	17	19	21	23	26	28	BA160
16	59	8	18	19	19	15	16	14	14	12	13	14	14	15	16	120
17	57	19	28	29	29	20	20	17	18	16	17	18	19	21	23	120
18	133	11	27	28	28	20	20	17	18	16	17	19	21	23	25	120
21	23	27	35	36	37	22	23	18	19	17	17	18	19	20	21	BA160
22	20	11	17	18	18	16	16	15	15	14	15	16	18	20	22	BA160

QMD	ACRES PER UNIT	Existing Condition	Post Treatment	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Units	Acres	2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
		QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
23	48	14	20	20	18	16	17	15	17	15	16	17	17	18	20	120
24C	25	11	23	24	24	18	19	16	16	15	16	17	18	20	22	120
25	12	16	23	24	24	20	20	18	19	17	19	21	23	26	28	120
26	57	21	30	31	31	21	22	18	19	16	17	18	19	21	22	BA160
27	17	10	19	20	20	17	17	15	16	15	16	18	20	22	25	120
28	11	16	20	21	21	18	18	16	17	16	17	19	21	23	26	120
29	38	12	17	18	18	16	16	15	16	15	17	18	20	22	24	120
30	10	10	16	16	16	15	15	14	15	14	16	18	20	22	24	120
33A	10	13	15	16	16	15	15	14	15	14	16	18	21	23	25	120
34	11	17	23	25	25	19	20	17	18	16	18	20	22	24	27	120
35	36	12	20	21	21	17	18	16	16	15	17	19	22	24	27	120
37	143	10	12	12	13	12	12	12	12	12	12	13	14	16	18	120
38	5	17	19	20	19	17	18	16	16	15	17	19	21	23	25	120
39	59	7	12	13	13	12	12	12	12	12	14	15	17	19	21	120

Twenty one units' existing conditions do not meet USF&W foraging requirement. Six units existing conditions meet low quality foraging values. Nine units existing conditions meet USF&W parameters. Treatment effects for all foraging units' enhance habitat increasing the QMD to values that meet or exceed USF&G foraging parameters. Post treatment twenty five units' QMD values are represent nesting values while only two units have value that meet low quality foraging.Prescribed fire treatment effects assist to sustain initial treatment effects, and post fire treatment 2024

the two low quality units are enhanced to foraging.The overall treatment effects are a greater reflection of late-successional habitat. In addition, the existing QMD typifies mid seral habitat conditions. Post treatment QMD value are representative of late seral habitat conditions.

Table 26Dispersal QMD per Acre

QMD	ACRES PER UNIT	Existing Condition	Post Treatment	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Units	Acres	2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
		QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	QMD	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
24A	14	7	16	17	17	15	15	14	14	13	14	15	16	17	18	120
24D	21	7	16	17	17	15	15	14	14	13	14	15	16	17	18	120
31	24	15	23	24	24	18	19	16	17	15	17	18	19	21	23	120
32	45	14	24	24	24	19	19	16	17	15	17	18	20	22	24	120

Two units existing conditions do not meet USF&W foraging requirement. One unit has values associated with nesting, and one unit has values associated with foraging.All Dispersal units' treatment effects enhance habitat increasing the QMD.Post treatment all express values associated with nesting parameters. The overall treatment effects are a greater reflection of late-successional habitat. Prescribed fire treatment effects assist to sustain initial treatment effects. Therefore, the treatment effect is to enhance the quality of late-successional habitat structure.

8.3.9 USF&W Total Basal Areaper acre Indicator:

Basal Area: Basal area is a measure of stand density or stocking. Basal area is the cross section area of a tree stem in square feet measured at breast height (4.5 feet above ground) and inclusive of bark. Stocking density is determined by the sum of the basal areas for all trees on a per-acre basis. Basal area was the determining variable used to model residual stand density and canopy cover levels. Basal area is a measurement used to describe stand stocking levels for wildlife habitat.

Calculation to assess Basal Area changes, were performed to determine the effects tobasal area. Table 27 Nesting, Table 28 Foraging and Table 29 Dispersal presents the existing condition indicator values and post treatment and future conditions indicator values modeled by FVS.

Table 27 Nesting Total Basal Area per Acre

TOTAL BASAL AREA	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	
Treatment Effects			Treatment Effect Habitat Enhanced*					Treatment Effect Within Habitat Range**						No Effect***		
3A	12	215	202*	214	213	234	228	242	238	247	248	250	251	252	253	160
19	20	279	254*	264	264	278	272	281	275	280	280	280	280	280	280	BA2 40
24B	9	330	160*	165	162	178	178	193	194	208	226	245	264	280	298	160
33B	18	219	201*	217	219	247	238	252	250	255	257	259	260	261	262	160

All units existing conditions represent USF&W nesting basal area values. Treatment effects keep all Nesting units within the nesting total basal area habitat range, and maintain late-successional habitat. Prescribed fire treatment effects assist to sustain initial treatment effects.

Table 28 Foraging Total Basal Area per Acre

TOTAL BASAL AREA	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	
3B	24	191	168	176	176	191	190	205	202	211	221	234	240	242	243	120
4	86	239	171	182	182	201	200	214	211	221	234	242	243	245	247	120
5	29	232	142	150	151	165	166	181	181	196	211	227	242	243	245	120
6	113	246	157	166	167	186	188	208	209	225	238	247	248	250	251	120
7	77	342	190	203	201	228	227	252	254	279	305	328	350	371	393	120
8	131	248	163	176	177	205	205	231	232	254	274	293	293	293	293	120
9	16	207	170	172	191	192	210	208	221	235	250	253	253	253	251	BA160
12	32	342	173	183	184	205	206	227	229	250	275	299	322	345	362	120
13	59	228	178	186	184	198	193	203	199	209	220	234	244	245	247	120
14	91	273	172	180	179	197	197	216	216	234	248	264	272	273	273	120
15	107	260	162	173	174	198	200	224	226	247	262	263	264	264	265	BA160
16	59	354	135	139	140	149	149	157	158	167	178	193	214	240	271	120
17	57	250	134	143	145	164	164	182	183	202	220	236	250	251	252	120
18	133	274	150	158	159	177	178	198	199	223	246	267	272	273	273	120

TOTAL BASAL AREA	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	
21	23	268	162	170	172	189	190	205	206	222	238	252	264	278	282	BA160
22	20	281	163	173	174	195	197	217	218	237	253	271	280	280	280	BA160
23	48	298	166	174	157	172	162	176	166	180	200	219	236	251	269	120
24C	25	253	144	151	151	167	168	183	184	201	219	237	253	255	257	120
25	12	243	218	226	225	240	232	242	238	242	242	242	242	242	242	120
26	57	265	167	176	177	195	196	213	214	232	246	260	274	275	276	BA160
27	17	237	137	148	150	175	177	202	204	228	249	274	277	278	279	120
28	11	281	154	167	169	197	198	224	225	249	266	280	280	280	280	120
29	38	367	200	215	214	248	247	278	281	306	331	358	366	366	366	120
30	10	266	182	195	197	223	220	239	237	254	272	273	275	277	279	120
33A	10	177	164	178	179	203	203	222	220	236	247	249	253	255	257	120
34	11	193	143	156	158	186	188	216	219	244	261	268	269	271	272	120
35	36	202	135	147	148	173	175	201	203	223	243	249	251	252	252	120
37	143	250	150	159	159	177	177	191	191	206	222	240	259	259	261	120
38	5	275	169	182	182	212	215	235	235	252	271	274	274	274	274	120

TOTAL BASAL AREA	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	
39	59	191	133	144	146	174	176	199	201	222	243	264	265	266	267	120

All units existing conditions represent USF&W foraging basal area values. Treatment effects keep all foraging units within the foraging total basal area habitat range, and maintain late-successional habitat. Prescribed fire treatment effects assist to sustain initial treatment effects.

Table 29 Dispersal Total Basal Area per Acre

TOTAL BASAL AREA	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Year		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
24A	14	307	158	168	169	189	187	206	206	224	246	262	280	298	317	120
24D	21	307	158	168	169	189	187	206	206	224	246	262	280	298	317	120

TOTAL BASAL AREA	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
Year		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	Total BA	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
31	24	203	136	145	146	167	169	190	191	215	238	257	272	273	274	120
32	45	208	152	161	162	182	183	202	203	224	243	263	271	272	273	120

All Dispersal units' treatment effects are within theUSF&W foraging total basal area habitat range, and maintain late-successional habitat. Prescribed fire treatment effects assist to sustain initial treatment effects.

8.3.10 U. S Fish & Wildlife Percent Canopy Cover per Acre:

Canopy cover is the degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. Canopy cover relates to the ground area covered by a vertical projection of the canopy, and is expressed as a percent of ground area covered. Canopy cover is another stand attribute that is used to describe wildlife habitat and fuel hazard conditions. Refer to the fuels specialist report and the wildlife specialist Biological Assessment/Biological Evaluation of Terrestrial Wildlife Species report for associated treatment effects.

Calculation to assess canopy changes, were performed to determine the effects to percent canopy cover.Table 30 Nesting, Table 31 Foraging and Table 32 Dispersal presents the existing condition indicator values and post treatment and future conditions indicator values modeled by FVS.

Table 30 Nesting Percent Canopy Cover per Acre

CANOPY COVER	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
3A	12	68	65	65	64	65	63	62	60	60	56	55	53	52	51	160
19	20	67	60	60	60	61	60	60	59	59	58	57	56	55	54	BA240
24B	9	80	61	62	59	62	62	64	61	64	66	67	68	69	69	160
33B	18	81	71	71	71	70	67	65	64	62	60	58	56	55	54	160

All Nesting units' treatment effects are within the USF&W nesting percent canopy habitat range, and maintain late-successional habitat. Prescribed fire treatment effects assist to sustain initial treatment effects.

Table 31 Forage Percent Canopy Cover per Acre

CANOPY COVER	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
3B	24	68	62	63	63	65	64	66	65	65	65	66	65	63	62	120
4	86	77	62	64	63	66	64	65	63	63	64	63	61	59	58	120
5	29	74	47	49	48	52	50	53	53	57	59	62	63	61	59	120
6	113	74	51	53	52	55	55	58	58	60	60	60	58	57	56	120
7	77	91	64	66	66	70	69	73	73	76	78	80	82	83	85	120
8	131	85	56	57	57	61	61	64	64	66	68	69	66	64	62	120
9	16	64	40	42	42	47	46	50	48	51	54	56	55	55	54	BA160
12	32	91	56	57	57	59	59	62	62	65	68	70	72	74	75	120
13	59	85	74	75	73	74	72	72	70	71	71	72	72	70	68	120
14	91	78	55	56	56	58	58	61	61	63	64	65	64	63	61	120
15	107	72	42	43	43	47	48	51	52	55	56	55	55	54	54	BA160
16	59	87	42	43	42	45	45	47	47	50	53	56	60	64	69	120
17	57	64	40	40	41	44	44	47	47	50	52	54	55	54	53	120
18	133	76	46	47	47	50	50	53	53	57	60	61	61	59	58	120
21	23	58	40	40	40	44	44	47	47	50	53	55	57	59	59	BA160
22	20	69	43	45	45	50	50	55	54	58	60	62	62	61	60	BA160
23	48	82	61	62	55	57	52	54	50	52	55	58	60	61	63	120

CANOPY COVER	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
24C	25	69	47	48	48	51	51	54	54	57	59	61	62	60	58	120
25	12	74	71	72	71	71	69	69	67	66	64	61	59	58	56	120
26	57	63	42	44	44	47	47	50	50	53	55	57	58	58	58	BA160
27	17	63	40	43	43	49	49	54	54	58	61	64	64	63	62	120
28	11	76	54	55	56	60	60	63	63	65	66	66	64	62	60	120
29	38	92	74	75	75	78	77	79	79	80	80	80	78	75	73	120
30	10	79	64	65	66	69	67	69	68	69	71	69	68	66	66	120
33A	10	72	67	69	69	70	69	70	69	69	67	63	61	59	57	120
34	11	53	44	46	46	51	51	56	56	59	61	60	59	58	58	120
35	36	65	44	46	46	50	50	54	54	56	57	55	54	52	51	120
37	143	71	53	55	53	58	57	60	59	62	65	67	69	67	65	120
38	5	78	64	65	65	68	68	70	69	70	70	67	64	62	60	120
39	59	66	40	41	42	47	48	52	52	56	59	61	61	60	60	120

All Foraging units' treatment effects are within theUSF&W foraging percent canopy habitat range, and maintain late-successional habitat. Prescribed fire treatment assist to sustain initial treatment effects.

Table 32 Dispersal Percent canopy Cover per Acre

CANOPY COVER	ACRES PER UNIT	Existing Condition	Post Harvest	Before Fire	Post Fire	Before Fire	Post Fire	Before Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	Treatment Leave Tree BA
		2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104	
Unit	Acres	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	
Treatment Effects			Treatment Effect Habitat Enhanced					Treatment Effect Within Habitat Range						No Effect		
24A	14	85	64	65	66	68	66	69	68	71	73	74	75	76	77	120
24D	21	85	64	65	66	68	66	69	68	71	73	74	75	76	77	120
31	24	61	40	41	42	46	46	50	50	54	58	60	61	60	60	120
32	45	64	50	51	51	54	54	58	58	61	63	65	65	64	63	120

All Dispersal units' treatment effects are within the USF&W percent canopy habitat range, and maintain late-successional habitat. Prescribed fire treatment effects assist to sustain initial treatment effects.

8.3.11 Stand Density Index Indicator:

Stand Density Index (SDI) is a method of characterizing stand density that uses both tree diameter at breast height (DBH) and trees per acre (TPA). SDI, developed by Dunning and Reineke (1933)**,** provides a measurable means to establish the relationship between current stocking and the potential maximum stocking. SDI can also be used as a species-specific measure of tree competition for resources (nutrients, water, and sunlight). SDI has an advantage over basal area because it is not significantly affected by age and site quality.

The calculated SDIs values were evaluated based on density ranges low, moderate, high and extremely high density. **Table 33**Base Line Stand Density Index displays the maximum SDI for the major species within the Pine Mountain Project Area, and the percent of maximum SDI range levels at different stocking densities(Long 1985).Because Douglas-fir is the overall dominate basal area species, SDI effects analysis utilized Douglas-fir maximum SDI value to determine effects level. Refer to **Table 33Existing and FVS Projected Stand Density Index Response to Treatment.**

Table 33Existing and FVS Projected Stand Density Index Response to Treatment

Stand Density Index	Existing Condition	Post Harvest	Simulate Fire	Post Fire	Simulate Fire	Post Fire	Simulate Fire	Post Fire	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments	No Treatments
	2016	2018	2023	2024	2034	2035	2044	2045	2054	2064	2074	2084	2094	2104
Unit	SDI	SDI	SDI	SDI	SDI	SDI	SDI	SDI	SDI	SDI	SDI	SDI	SDI	SDI
3A	357	208	220	222	276	271	312	306	336	326	319	311	303	295
3B	322	157	163	164	205	205	240	232	260	272	285	291	291	291
4	418	159	168	169	215	213	249	243	273	287	293	292	291	289
5	457	166	174	175	212	212	247	243	276	291	308	320	313	308
6	436	153	161	162	215	213	259	257	295	308	314	310	306	302
7	746	162	172	175	219	220	260	260	300	322	341	358	373	388
8	548	163	174	176	229	230	276	274	316	335	354	349	343	336
9	430	222	231	231	275	274	311	306	336	349	363	353	341	330
12	756	144	153	155	214	214	261	259	303	330	357	382	405	422
13	433	173	179	180	213	211	237	233	259	270	284	293	293	293
14	493	151	158	159	208	207	250	246	284	299	316	323	319	315
15	456	205	216	217	276	276	327	324	367	375	359	346	334	324
16	701	148	152	152	190	188	217	215	242	255	272	295	325	359
17	353	146	155	156	212	210	254	250	292	311	327	340	332	322
18	486	151	159	160	212	212	256	254	301	325	347	345	336	328
19	398	310	319	319	367	354	388	375	399	388	378	368	358	351
21	330	180	187	188	252	251	296	293	334	353	365	376	388	383
22	489	208	217	218	270	269	314	309	351	364	381	383	370	359
23	474	159	166	164	205	184	223	198	236	258	279	296	311	327
24A	632	157	166	166	211	211	249	247	284	306	322	341	356	374
24B	595	193	201	204	259	255	299	298	338	359	373	389	403	405
24C	442	144	150	152	201	198	238	236	276	295	315	329	324	319
24D	632	157	166	166	211	211	249	247	284	306	322	341	356	374
25	372	162	172	172	220	214	250	243	270	266	263	259	255	252
26	363	190	199	200	259	257	303	301	343	356	369	381	372	364
27	435	157	167	169	223	222	271	270	312	330	350	340	331	323
28	430	158	169	171	228	228	278	274	319	336	348	342	335	327
29	626	172	186	186	244	245	298	298	347	377	407	418	419	417
30	485	164	175	177	224	223	262	256	293	309	306	304	300	297

31	321	158	168	168	220	219	265	262	310	334	352	364	353	344
32	337	151	159	160	212	211	255	252	295	314	334	336	328	321
33A	291	172	185	188	237	234	275	271	306	316	314	312	308	302
33B	462	162	175	177	231	231	275	270	306	318	316	314	311	307
34	289	161	173	175	235	234	290	289	337	352	350	342	333	326
35	343	167	179	181	234	235	287	287	327	346	342	331	319	309
37	461	171	179	179	214	215	244	243	273	286	303	319	312	307
38	409	158	169	171	227	227	270	267	306	324	324	320	316	312
39	395	175	186	188	238	239	278	277	312	329	343	328	317	307
Average	458	171	180	181	231	230	271	267	305	321	331	335	334	332
Max	756	310	319	319	367	354	388	375	399	388	407	418	419	422
Min	289	144	150	152	190	184	217	198	236	255	263	259	255	252

Table 34 Base Line Stand Density Index

Species	DF	PP	SP	BO	MD	Site Occupancy (Colors Refer to Table 36)
Max SDI	547	571	647	382	588	
Density Range	% Maximum SDI*					
Low Density 0-24.9%	0-136	0-142	0-161	0-95	0-146	Less than full site occupancy, No competition between trees
Moderate Density 25-34%	137-190	143-199	162-225	96-133	147-205	Less than full site occupancy, Onset of competition between trees - 25 percent of maximum SDI
High Density 35-55%	191-305	200-319	226-361	134-213	206-328	Full site occupancy—35 percent of maximum SDI, Active competition between trees, Upper range of zone marks the threshold for the onset of density-related mortality
Extreme High Density 56%+	306+	320+	362+	214+	329+	Full site occupancy, Severe competition between trees, Active competition-induced mortality

Reviewing **Table 33 Existing and FVS Projected Stand Density Index Response to Treatment** indicates that 36 out of the 38 treatment units are within the zone of extreme high density where full site occupancy, severe competition between trees and active competition-induced mortality is occurring. The other two treatment units 33A and 34 fall within the zone of full site occupancy where there is active competition between trees. These units are also within the upper range of the zone that marks the threshold for the onset of density-related mortality. Stand densities will be reduced in all treatment units. Treatment effect is to move 30 treatment units SDI from extreme high density to the moderate density zone of Less than full site occupancy. 6 treatment units move from extreme high density to the high density zone, and 2 units move from high density zone to the moderate density zone.

Studies have shown that accelerated development of many of the structural components of late-successional stands can be achieved (Oliver 1992, Marshall 1991) through reduced stand density that provide fewer small diameter trees and wider spacing between residual larger diameter trees. The effect to late successional habitat is to provide the site condition to develop structural characteristics for late successional species. Thinning effects reduce the stand density of trees to improve growth and yield, enhance stand health, and reduce potential mortality. More specifically, thinning from below and planned variable density thinning, effects the removal of trees primarily from the lower crown classes to favor those in the upper crown classes, or specific species or species groups where density encroachment is creating a decline is species diversity.

The treatment effect which changes the SDI density range will have an overall effect to enhance development and promote longevity to continue late successional habitat into the future. The post treatment forest will reflect late successional forest structure with competition levels similar to historic conditions. Stand density will be at a level where prescribed fire can be applied to maintain and enhance stand structure into the future.

8.4 Treatment Prescription 4 - Shaded Fuel Break

The treatment areas associated with this prescription are divided into two 500 foot wide shaded fuel breaks along National Forest System land bordering roads. A 500-foot wide shaded fuelbreak will be constructed beginning at the intersection of Elk Mountain Road (M-1) and forest road 18N05. Heading westward along portions of forest road 18N05, 17N23, 18N69 and 18N47, following the Pine Mountain ridge and tying into forest road M-8. The shaded fuelbreak will provide a defensible space for fires originating from the west and moving eastward with the prevailing winds, and also serve to assist prescribed fire activities.

Another 500 foot wide shaded fuelbreak will be constructed along portions of Elk Mountain Road that pass through National Forest land. Derived benefits stem from having a defensible space associated with Elk Mountain Road which is the main access route from Upper Lake, through the LSR, to the Pillsbury Basin. Prescribed fire activities will be able to utilize the fuelbreak as a staging area.

8.4.1 Treatment Prescription 4 Existing Vegetationand Fuel Conditions

Prescription 4 was developed to establish strategic fuel breaks slow and control the spread of wildfires

8.4.2 Vegetative Cover, Structure, Diameter Size Class, Stand Density and Acreage

Vegetative Cover Type: The two Fuelbreaks associated with treatment prescription 4pass along a variety of vegetation types. The California Wildlife Habitat Relationship system identified eight different vegetation types. **Table 35 CWHR Vegetation Types Treatment Prescription 4 Acreage**displays the various vegetation type acreages in terms of California Wildlife Habitat Relationship vegetation types.

Table 35CWHR Vegetation Types Treatment Prescription 4 Acreage

CWHRTYPE CODE	CWHR Vegetation Type	Acreage

CWHRTYPE CODE	CWHR Vegetation Type	Acreage
COW	**Coastal Oak Woodland**	9
CPC	**Closed Cone Pine**	4
DFR	**Douglas fir**	37
MCH	**Mixed Chaparral**	35
MHC	**Montane Hardwood Conifer**	122
MHW	**Montane Hardwood**	24
PPN	**Ponderosa Pine**	66
SMC	**Sierran Mixed Conifer**	743
	Grand Total:	**1040**

8.4.3 Direct and Indirect Effects

Since the majority of the acre associated with Prescription 4 treatment is within the commercial treatment units and follows prescription 3 guidance, refer to Prescription 3 effects analysis. The indirect effect will be a reduced tree density and the potential to slow the spread of wildfire if it occurs in the area.

Diameter Size Class: The direct effect to size class will be the maintenance of the large tree component made up of black oak, sugar pine, ponderosa pine, and Douglas-fir and a reduction in the number of trees less than or equal to 10 inches DBH. Refer to the fuels specialist report.

Stand density: Direct effects to stand density within commercial units were discussed in Prescription 1-3 and 5-7. The direct effects to stand density associated with the area outside of commercial units are a reduction in tree and brush densities. Fuel treatment and prescribed fire design standards were developed to minimize potential impacts to stand density. The hand piling, pile burning and under burning of pre-existing surface downed woody debris and activity fuels would have the direct effect of reducing surface fuel loads to 5-10 tons per acre. Refer to the fuels specialist report. Refer to the fuels specialist report.Indirect effects, as mentioned previously include a potential change in fire behavior if wildfire occurs in the Pine Mountain vicinity.

Activity Fuel Treatment: The direct effect caused by thinning without activity fuel treatment is to increase wildfire hazard. (Agee and Skinner 2005). (Placeholder1) The treatment prescription proposes to apply fuel treatments as prescribed fire or as a combination of prescribed burning, hand or mechanical density reduction (thinning), hand or mechanical piling, or chipping. Where treatment requires thinning and activity fuel are created prescribed fire will be used to abate post thinning activity fuels to maintain surface fuel desired condition. Prescribed fire may be applied as broadcast burning, pile burning or combined treatment. The direct effects would be a reduction in fuels and indirect effects would be an expected change in fire behavior in this area if a wildfire were to occur.

Acreage: Acreage occupied by the present seral stage will change as described in treatment prescription 3. Direct effects to seral stage is a change in acreage form mid seral stage to mature seral stage. Refer to treatment prescription 3. The indirect effects to seral stage will occur over time as a result attributed to increased individual tree growth. Prescription 4 fuel reduction activities will have the effect of establishing safer and more effective anchor points for

fire-suppression efforts, and contribute to the creation of effective ignition zones for future prescribed fire activities.Shaded fuelbreaks effects will be a reduction in the amount of fuel, modify the types of fuel and improve their arrangement. Refer to the fuels specialist report.

Canopy: The shaded fuelbreak treatment will have the effect of leaving the forest canopy intact consistent with late successional species habitat needs. The effect of the shade cast by the forest canopy helps to reduce the regeneration of plants on the forest floor. In turn, keeping the amount of fuel low prolonging the fuelbreaks effective period.**Note:** A shaded fuelbreak differs from a firebreak where a bulldozer or other equipment is used to create a bare-ground break with no vegetation

Conclusion: Direct and indirect effects of the proposed action are not considered adverse from a vegetation management perspective, but rather beneficial in reducing excess surface fuel hazard and potential wildfire impacts. Treatment is expected to combine with other project area treatments to reduce the risks of natural disturbances to the Pine Mountain Late Successional Reserve.

8.5 Treatment Prescription 5 - Chaparral Management

The treatment consists of using prescribed fire as the primary tool for strategic fuel reduction that breaks up the continuity of large chaparral fields without resulting in large-scale changes in habitat type. Prescribed burning will be conducted in such a manner to limit moderate intensity fire from entering adjacent vegetation types. The effect of prescribed fire use will be to stimulate chaparral regeneration, contribute to the development of diversity in seral stages and reducing fuel loading.Burning would be performed by hand and/or aerial ignition sources. Within the treatment areas, the effect will be the development of a mosaic burn severity pattern. In general, this mosaic would be based on existing vegetation conditions.

8.5.1 Treatment Prescription 5 Existing Vegetation and Fuel Conditions

8.5.2 Vegetation Cover Type and Acreage

Chaparral treatment area accounts for approximately 1822 acres of the project area and typically occursintermixed with chaparral and other forested vegetation types. Within the unit boundarieschaparral patches ranging from 3 to 40 acres in size make up approximately 32 percent of the treatment area. **Table 36 Vegetation Types and Seral Stage Treatment Prescription 5 Acreage** displays the treatment area's vegetation types in terms of California Wildlife Habitat Relationship vegetation types; seral stage; and acreage associated with different vegetation types.

Table 36:Vegetation Types and Seral Stage Treatment Prescription 5 Acreage

Unit	CWHR Vegetation Type

Number Seral Stage	Annual Grass Land	Blue Oak Foothill Pine	Blue Oake Woodland	Coastal Oak Woodland	Chamise-Redshank Chaparral	Douglas fir	Mixed Chaparral	Montane Hardwood Conifer	Montane Hardwood	Ponderosa Pine	Sierran Mixed Conifer	Total Acres
88	**8**			**6**	**119**	**5**	**135**	**64**	**237**	**11**	**53**	**637**
Early									**3**			
Mid				6				7	**77**	**8**	**1**	
Late						1		33	**12**		**29**	
Mature						4		24	**145**	**3**	**23**	
Decadent					**119**		**135**					
N/A	**8**											
89	**5**	**1**	**6**		**102**	**28**	**250**	**205**	**507**	**8**	**73**	**1185**
Early								**1**	4			
Mid		**1**	**6**			4		**20**	**472**	8	2	
Late						24		184	34		65	
Mature											6	
Decadent					**102**		**250**					
N/A	**5**											
Grand Total	**13**	**1**	**6**	**6**	**221**	**33**	**385**	**269**	**744**	**19**	**126**	**1822**

8.5.3 Vegetation Structure – Size Class and Density

Size Class:

Chaparral Vegetation: In general, chaparral is considered an early-successional vegetation type because it quickly establishes on a site following a disturbance such as high intensity wildfire. However, stand characteristics within the chaparral vegetation type are not static and change over time. Thus, there are seral stages within the chaparral vegetation type. The California Wildlife Habitat Relationship system describes shrub seral stages in terms of seedling shrub, young shrub, mature shrub or Decadent shrub. Classification is based on the time lapse since the last disturbance event. Since the last known wildfire to take place with the chaparral stands associated with the treatment area occurred in 1932, the project area chaparral shrubland is classified using the California Wildlife Habitat Relationship system to fall within size class descriptions of decadent.

Forest Vegetation: The treatment area forested habitat occurs in a mosaic-like pattern with small pure stands of conifersinterspersed with stands of broad-leaved trees. Conifer vegetation type makes up 10 percent of the treatment area, and hardwood vegetation types make up 57 percent.The size class distribution is reflective of the cover type present. There may be a pronounce upper layer of hardwoods with either a shrub stratum underneath or even a conifer seedling/sapling stratum underneath, or the upper layer may be dominated by conifer treesranging from small to large trees. There are areas where seedling/sapling trees are dense and overcrowded contributing to excessive ladder fuel levels. There are also areas that have

high surface fuel loading.The California Wildlife Habitat Relationship system describes forestland seral stages tree size classes in terms of seedling, sapling, pole, small tree and medium/large tree. Prescription 5 treatment area forested stands are classified by the California Wildlife Habitat Relationship system to fall within size class descriptions ranging from seedling to large tree developing early, mid, Late and mature seral stages.

Density: Chaparral cover density is measured in term of percent canopy closure. Chaparral canopy closure ranges from 60 to 100 percent for the decadent classification.Forest stand cover density is measured in term of percent canopy closure. Forest stand canopy closure ranges from 10 to greater than 60 percent.

8.5.4 Direct and Indirect Effects

As described under the Vegetation Cover Type and Acreage, there is an unbalanced distribution of habitat skewed towards decadent chaparral. In order to provide habitat diversity, the treatment prescription will have the effect of increasing the proportion of younger chaparral stands.

Vegetation Cover Type:

Chaparral Treatment Prescription 5 would have a direct effect to chaparral cover type through reducing the existing decadent chaparral vegetation and initiating the succession to young chaparral vegetation. The beneficial effect will be an increase in habitat heterogeneity through the development of young seral stage habitat. The effect within the treatment areas will be the development of a mosaic burn severity pattern. Generally, patches of 30-70% mortality are expected. However, the Decadent chamise fields are expected to be more extensively consumed.

Forest: The forested area will have low intensity prescribed burning applied. The low intensity prescribed fire will serve to protect conifer and hardwood overstory trees through ladder and surface fuel reduction. However, where only prescribed fire is applied minimal reduction in stand density will occur. The primary goal is associated with surface fuel reduction. No treatment to upper story vegetation is proposed.

Fuel Conditions Effects: Proposed activities would result in vegetative cover conditions that produce manageable fire behavior.Proposed activities would also make the area more suited for future prescribed fire applications; therefore, progress would be made toward initiating the restoration of ecological processes. The treatment prescription moves all cover types vegetative conditions closer to the desired vegetative conditions which will effect a reduction in mean fire return interval (MFRI).

8.5.5 Vegetation Structure – Size Class, Density and Acreage

Size Class: The direct effect to the chaparral vegetation will be the change is size class. Prescribed fire will remove decant chaparral and initiate seedling stage establishment. The direct effect to the forest vegetation type will be limited to reduction of seedling/sapling trees that are less than 10 inches DBH.

Density: Changes to chaparral canopy closure will be short term generally less than three years as vegetation recovers through seedling and sprout regeneration. Chamise-Redshank Chaparral vegetation type is expected to reach a mature shrub seral stage after approximately two years and remain at that stage for an additional 8 years before returning to the decadent

shrub stage. Upon reaching the mature shrub stage, canopy closure will return to 60 to 100 percent cover. Montane chaparral will quickly establish a young shrub stage and after five years change to mature stage and remain at that stage for an additional 15 years before returning to the decadent shrub stage. Canopy closure will range from 10 to 24 percent during the young shrub stage before reaching to 60 to 100 cover at the mature stage. However, treatments will increase vegetative diversity and forage quality. Shrubland habitat will have changed from declining forage habitat to a habitat that will present a more palatable degree of forage opportunity. Changes to the forest canopy will be minimal only lower story seedling/sapling trees will have direct treatment.

Acreage: The acreage occupied by post treatmentnon-forest existing vegetation types is expected to remain the same with only a change to the seral stage. There is no anticipated change to the forested vegetation acreage in terms of vegetation types or seral stage. Treatment effects to this type will be limited to lower story vegetation.

Conclusion: Direct and indirect effects of the proposed action are not considered adverse from a vegetation management perspective, but rather beneficial in developing habitat diversity. Treatment is expected to combine with other project area treatments to reduce the risks of natural disturbances to the Pine Mountain Late Successional Reserve.

8.6 Treatment Prescription 6 - Back Fire Fuel Reduction

The treatment consists of using prescribed fire as the primary tool for strategic fuel reduction.The most effective method is to understory and jackpot burn; however, hand piling and chainsaw work may be utilized. The treatment goal is to follow up on the naturally ignited 2008 Back Fire to continue to develop a fire interval that restores and enhances the burned area's ecological function.

8.6.1 Treatment Prescription 6 Existing Vegetation and Fuel Conditions

8.6.2 Vegetation Cover Type and Seral Stage Acreage

Back Fire Fuel Reduction treatment applies to Units 77 and 79, and the area accounts for approximately 444 acres of the project area within boundaries of the 2008 Back Fire. The Back Fire created a mosaic of burn effects as a result of the variable fire intensity levels. These two units experienced a lower fire intensity which reduce the canopy cover from dense cover greater than or equal to 60 to moderate cover 40 to less than 60 percent.

The California Wildlife Habitat Relationship system describes forestland seral stages tree size classes in terms of seedling, sapling, pole, small tree and medium/large tree. Prescription 6 treatment area forested stands are classified by the California Wildlife Habitat Relationship system to fall within size class descriptions ranging from seedling to larger trees developing early, mid, Late and mature seral stages. **Table 37 Vegetation Types and Seral Stage Treatment Prescription 6 Acreage** displays the treatment area's vegetation types in terms of California Wildlife Habitat Relationship vegetation types; seral stage; and acreage associated with different vegetation types.

Table 37 Vegetation Types and Treatment Prescription 6 Acreage

Unit Number	CWHR Vegetation TYPE

Seral Stage	Montane Hardwood Conifer	Montane Hardwood	Ponderosa Pine	Sierran Mixed Conifer	Total Acres
77	**4**	**15**	**42**	**301**	**362**
Early	4	15	28	30	77
Mid				16	16
Late			14	255	269
79				**82**	**82**
Early				1	1
Mid				45	45
Late				36	36
Total	**4**	**15**	**42**	**383**	**444**

8.6.3 Vegetation Structure – Size Class and Density

The treatment area forested habitat is occupied by stands that reflect the Sierran Mixed Conifer vegetation type. Conifer dominated vegetation type makes up 97 percent of the treatment area, and hardwood vegetation types make up only 3 percent. The size class distribution is reflective of the cover type present. Conifer seedling and underbrush have establishedfollowing the wildfire underneath the overstory canopy. There are also areas that have high surface fuel loading.

8.6.4 Direct and Indirect Effects

Vegetation Cover Type: The forested area will have low intensity prescribed burning applied. The low intensity prescribed fire will serve to protect conifer and hardwood overstory trees. Seedlings and brush species that have develop since the Back Fire will be treated by application of prescribed fire, but the primary goal is associated with surface fuel reduction. No treatment to upper story vegetation is proposed.

Fuel Conditions Effects: Proposed activities would result in vegetative cover conditions that produce manageable fire behavior.Proposed activities would also make the area more suited for future prescribed fire applications; therefore, progress would be made toward initiating the restoration of ecological processes. The treatment prescription moves all cover types vegetative conditions closer to the desired vegetative conditions which will effect a reduction in mean fire return interval (MFRI). Treatment effects will bring these two unit areas closer to a historical fire regime and thus maintaining desired fuels conditions reflective of historical fire regimes.

8.6.5 Vegetation Structure – Size Class, Density and Acreage

Size Class: The direct effect to the forest vegetation type will be limited to reduction of seedling/sapling trees that are less than 10 inches DBH.

Density: Changes to the forest canopy will be minimal only lower story seedling/sapling trees will have direct treatment. Burning is expected to reduce the amount of small diameter surface fuel present in treated stands.The application of fire always has potential to kill some larger trees within timbered stands, but mortality is expected to be less than 10% in trees over

16" DBH (which meets the guidelines of the LSRA). Burning is expected to remove some existing snags and logs from the treated stands. However, where prescribed fire is applied the effect will be only minimal reduction in structural habitat. Refer to the Fuels Specialist Report for more information.

Acreage: There is no anticipated change to the forested vegetation acreage in terms of vegetation types or seral stage. Treatment effects to this type will be limited to lower story vegetation or surface fuels.

Conclusion: Direct and indirect effects of the proposed action are not considered adverse from a vegetation management perspective, but rather beneficial in developing late successional habitat diversity. Treatment is expected to combine with other project area treatments to reduce the risks of natural disturbances to the Pine Mountain Late Successional Reserve.

8.7 Treatment Prescription 7 - Riparian Reserve Management

Within the riparian reserves treatment area associated with treatment prescriptions 1-6, the appropriate unit-specific prescriptions would be applied with the additional specific protection measure described in Treatment Prescription 7.

8.7.1 Direct and Indirect Effects

The effects of the additional guidelines for Treatment Prescription 1, 2 4, 5, and 6 are as follows:

- SMZ vegetation treated will either be removed from the SMZ or piled in specific location. The effect will be to maintain SMZ natural ground cover, or to reduce pile burning effects by not burning piles. Piles would be left to serve as habitat for prey species.
- No active ignition within SMZ. Burning would be allowed to back down. The treatment effect resultlower intensity cooler burning fire with greater potential to develop a mosaic of burned and unburned areas.
- No hand pile burning would occur within 25 feet of the channel high water line. The effect will be a reduce potential for roll out of burning material that could affect lower portion of the SMZ.
- On slopes >60%, slash may be lopped and scattered, and within the lower 10 feet of the SMZ the slash is to be moved upslope >10 feet from the channel high water line. The treatment effect will be a reduced potential for roll out of burning material.

The effects of the additional guidelines for Treatment Prescription 3 are as follows:

- The treatment direct effect will be the exclusion of commercial thinning treatment will within the SMZ. Commercial thinning treatment will only be conducted within the riparian reserve from the SMZ boundary to the outer edge of the riparian reserve.
- Within the inner portion of the riparian reserves referred to as the SMZ portion located from the high water line to 50 feet out only trees less than 10 inches DBH would be thinned from below on 15-25 foot spacing, with leave tree spacing dependent upon tree size and crown diameter. The direct effect will be a reduction in small diameter ladder fuel trees while maintaining the larger diameter tree canopy within the SMZ.

- All tree cutting within the riparian reserve will be directional felled away from the watercourse limiting tree felling operation direct effects to the watercourse.
- Tree removal is limited to conifers. The direct effect is preserving all riparian obligate (near water dependent) vegetation, including within the RRs of seeps, springs, and unstable areas.
- Treatment design standard direct effect will limit ground disturbance within the reserve by limiting operation to slopes less than 35%, and tractor piling to slopes less than 25%.
- Treatment indirect effect will protect SMZ area by not permiting equipment operation within the SMZ. Direct effect is only hand removal (with chainsaws or hand tools) of vegetation within the SMZ is allowed.
- Treatment direct effect is the limitation of ground disturbance by retention 70-75% of existing ground cover (litter/duff) in the SMZ, and 60-65% of existing ground cover (litter/duff/rocks) in the remainder of the riparian reserve.In addition, on slopes >50%, retain 70-75% of existing ground cover (litter/duff/rocks) in the entire riparian reserve.
- Direct effect to canopy cover will be controlled by providing canopy cover retention level consistent with the unit prescription, with a minimum of 50% in intermittent and ephemeral SMZs, and 70% in perennial SMZs.
- The ground disturbance effects will be controlled by treating bare soil areas that exceed 50 square feet with mulch or slash, at the ground cover level appropriate for the slope class, if the area is likely to deliver sediment to a stream.

9.0Cumulative Effects

9.1 Cumulative Effect Project Area

The geographic area used to analyze the project area cumulative effects of vegetation management treatments covers approximately 10,200 acres. This includes public and private lands within the project area. The analysis area includes 7th field (approx. 3,500-8,000 acres) and 8th field watersheds (approx. 1,500-2,500 acres) see Hydrology report. Temporal Bounding of the analysis considers all ground-disturbing activities in the past (up to ten years prior), present, and reasonably foreseeable future. A complete listing of past timber harvest projects within this project area can be clearly seen in the early aerial photos (Refer to Figures 1-6). A total of 7, 537 acres of timber has been harvested from this project area (Refer to Table 6). These acres are a combination of clear cuts (672 acres), partial harvest (5,428 acres), fire salvage (1407 acres), and overstory removal (30 acres). A total of 2757 acres have burned within the project area since 1931and 1543 during thetemporal boundary 20 years (1995-2015) period. Refer to the Fuels Specialist Report

9.1.1 Past Federal Actions and Activities

The source of information for past federal actions and activities is located within the Forest Service Forest Service Activity Tracking System (FACTS) database. The temporal boundary is 20 years (1995-2015) and the spatial boundary is within the 7th field watershed.
All recorded activities are displayed on the map below (Refer to Figure 17). There are two general categories of activities: vegetation treatment (logging, site preparation, and tree planting)

and fuels treatment (past burning and fuels work). Past activities are considered and incorporated into the environmental analysis, as they contributed to the existing condition.

Table 38: Past Activities Summary (1995-2015) from FACTS Database

Activity	Date	On map
Broadcast Burning - Covers a majority of the unit	2002-2005	burning
Burning of Piled Material	2005-2013	burning
Certification of Natural Regeneration with Site Prep	1995	site prep
Certification of Natural Regeneration without Site Prep	2011	
Certification-Planted	1995-1996	tree planting
Chipping of Fuels	2004-2010	fuels work
Commercial Thin	2005-2008	logging
Fertilization	1995-1997	
Fill-in or Replant Trees	1996 and 2006	tree planting
Invasive - Mechanical /Physical	2009	
Invasive - Pesticide Application	2005	
Overstory Removal Cut (from advanced regeneration) (EA/RH/FH)	1997	logging
Piling of Fuels, Hand or Machine	2004-2012	fuels work
Plant Trees	1996,2004,2006,2010-2012	tree planting
Plantation Survival Survey	2004-2011	
Post Treatment Vegetation Monitoring	1995	
Precommercial Thin	1995-2012	fuels work
Rearrangement of Fuels	2003, 2008 and 2011	fuels work
Reforestation Need Created by Fire	2008	tree planting
Silvicultural Stand Examination	2005	
Site Preparation for Planting - Burning	2009	site prep
Site Preparation for Planting - Mechanical	2003 and 2008	site prep

Activity	Date	On map
Stand Silviculture Prescription	1996 and 2004	
Stocking Survey	1995-2008	
Thinning for Hazardous Fuels Reduction	2004-2012	fuels work
Tree Release and Weed	1995-2001	fuels work
TSI Need	1995-2008	
Underburn - Low Intensity (Majority of Unit)	2002-2013	fuels work
Wildfire - Fuels Benefit	2008	
Yarding - Removal of Fuels by Carrying or Dragging	2005 and 2007	logging

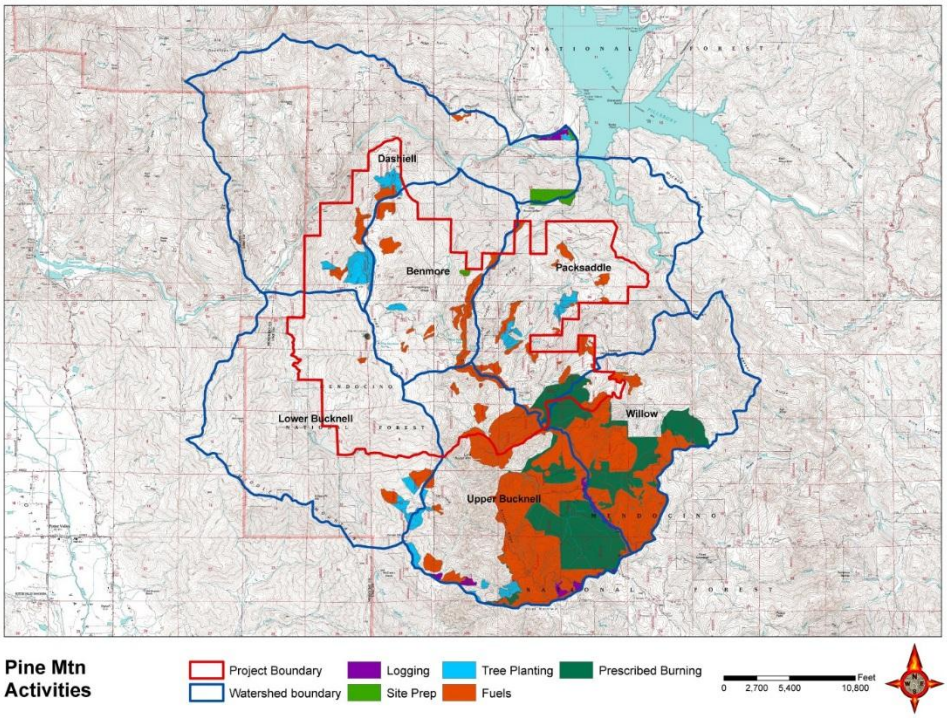


Figure 17 Known past, present and future activities within 7th field watershed.

9.1.2 Current and Reasonably Foreseeable Future Actions

The following projects are described as current and reasonably foreseeable future actions that may be considered in addition to the proposed project for analysis. Some ongoing actions are within the Pine Mountain project area; this list includes actions within the Dashiell, Packsaddle, Benmore, Willow, Upper Bucknell and Lower Bucknell 7th field watersheds.

The list also includes some actions immediately adjacent to these watersheds that may affect the environment of the project area.

Howard Mill Project *(planning complete, implementation ongoing)* is located within the Upper Bucknell Creek, Packsaddle, Willow, Bevans, Parramore, Sled Ridge, Grizzly Canyon and panther Canyon 7th field watersheds. The project encompasses about 7,400 acres. The main purpose of this project is to reduce hazardous fuel loading and competing vegetation in the mixed conifer plantations that were planted following the Round Fire in 1966. Approximately 4,900 acres have been understory burned since project implementation began.

Pine Mtn Lookout Project*(planning complete, implementation ongoing)* is located within the Lower Bucknell Creek 7th field watershed. The project encompasses about 26 acres, and includes hazardous fuels thinning >8" DBH and pile and understory burning.The main purpose of this project is to reduce hazardous fuel loading and to lessen the risk of fire, thereby protecting the historic lookout. Thinning was completed in 2007.

Elk Mountain Fuelbreak *(planning complete, implementation ongoing)* is located between the Middle Creek Campground and the Rice Fork turn off at Lake Pillsbury along Elk Mountain Rd (M-1). The project is about 700 acres, and includes hazardous fuels thinning >10" DBH and understory burning. The primary purpose of this project is to maintain a shaded fuelbreak along Elk Mountain Rd, serving as a strategic control point in an area historically known for large wildfires.

Westshore Project*(planning complete, implementation ongoing)* is located within the Welch, Mill, Boardman, and Dashiell 7th field watersheds. The project consists of 13 units and encompasses about 1,069 acres. The project includes hazardous fuels thinning >10" DBH, timber harvest, and pile and understory burning.The primary purpose of this project is to reduce hazardous fuels in the wildland-urban interface in the Lake Pillsbury Area. Timber Harvest was completed in 2013.

Streeter Ridge Project*(planning complete, implementation ongoing)* is located within the Upper Bucknell Creek 7th field watershed. The project encompasses about 262 acres, and includes hazardous fuels thinning >10" DBH and pile and understory burning.The main purpose of this project is to reduce hazardous fuel loading and competing vegetation in the mixed conifer plantations that were planted following the Round Fire in 1966. Thinning was completed in 2010.

Willow Creek Project*(planning complete, implementation ongoing)* is located within the Willow, Parramore, and Bevans 7th field watersheds. The project encompasses about 335 acres, and includes hazardous fuels thinning >10" DBH and pile and understory burning. The main purpose of this project is to reduce hazardous fuel loading and competing vegetation in the mixed conifer plantations that were planted following the Round Fire in 1966. The majority of the thinning was completed in 2011 and 2013.

High Horse Project*(planning complete, implementation ongoing)* is located within the Upper Bucknell, Parramore, Grizzly Canyon and Panther Canyon 7th field watersheds. The project encompasses about 545 acres in the Horse Mountain area, and includes hazardous fuels thinning >10" DBH, timber harvest, and pile and understory burning.The main purpose of this project is to reduce hazardous fuel loading and competing vegetation in the mixed conifer plantations that were planted following the Round Fire in 1966. Timber Harvest was completed in 2007.

There are no known additional future federal actions, other than the proposed actions and alternatives described in the Pine Mountain project.

There is no known timber harvesting activities within private inholdings adjacent to the project area within the 7th field watershed. This conclusion was drawn from the California Department of

Forestry and Fire Protection website inventory of approved timber harvest plans (THP) from October 2015.
(http://www.calfire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html)

Project area field examination indicates that forested stands are densely stocked with a high level of inter-tree competition resulting in loss of vigor, and increasing susceptibility to forest pests, especially during prolonged periods of low precipitation. Conditions are trending to poor stand health, higher fuel loads, and increased fire danger. The increasing density has led to a downward trend in the presence, establishment and health of sugar pine, ponderosa pine and black oak trees.

The current distribution has been established by past activities. Timber harvesting in the past has resulted in an altered distribution of seral stages compared to approximately 60 years ago, beforeactive timber harvest began. In addition, fire suppression has increased the number of small diameter trees.This combination has affected the project areas vegetative vigor, species composition, structure and wildfire resilience. The current stands have been affected by fire suppression and past timber harvesting operation to the extent that they are not representative of natural stand development processes under a frequent low-severity to mixed severity fire regime.

This alternative differs from past actions in that previous timber harvest consisted of regenerative harvest such as clear-cuts or substantial overstoreremovaltreatments. Followed by broadcast burning and planting operations that established Douglas-fir and ponderosa pine plantation. The current action proposes intermediate treatments focused on understory vegetation treatments that have the express intent of protecting and enhancing wildlife habitat for the future. Treatments are designed to stimulate the development of late seral forest conditions by restoring ecological processes. Restoration includes utilizing ecological forestry practices (variable density thinning) and prescribe burning which will mimic the natural disturbance regime (USDI 2011, NSO recovery plan).

In terms of past, proposed, ongoing, and foreseeable actions, Alternative 2 would not have negative cumulative effects to the vegetation structural stages. All seral stages will remain thesame for treatment prescription 1, 2 and 6.Positive cumulative effects will be provided by Treatment Prescription 3. Prescription 3 treatment will have the effect of changing the dominance of seral stages. Currently, nineteen units represent mid seral or mid successional stage and nineteen are present as mature seral or late successional. The treatment effect will enhance the seral and successional stages through density reduction of smaller diameter trees. The seral and successional stage of nineteen units currently classified as mature seral or late successional will remain the same, but the other nineteen units seral and successional stages will change post treatment to mature seral and late successional stage. Treatment prescription 3 will have the beneficial cumulative effect of maintaining or moving all prescription 3 units tomature seral and late successional stageafter treatment.Refer to **Table 17 Post Treatment Commercial Units CWHR Vegetation Types and Seral Stages** for the post treatment seral and successional stages. Refer to **Table 18 Seral and Successional stage Acreage Change**

Alternative 2 would improve the distribution of structural attributes over the long-term for species needing older forest habitat for part or all of their life cycle.All resource measurement indicators (Quadratic Mean Diameter andNumber of Trees per acre ≥26” DBH), Canopy Cover, Stand Density Index measurement indicator and Number of trees per acre) demonstrate a positive cumulative effect of enhanced vegetative and late successional habitat with increased fire resiliency.

9.1.3 Landscape Level Cumulative Effects

Several projects have been completed within 2 miles of the project area within the past 20 years or are ongoing and within 2 miles of the project area. There are several other fuels projects that are ongoing to the north and south of the project.(Refer to Figure 17)Thinning around Pine Mountain Lookout and the Elk Mountain Fuel Break thinning projects are within the project area. The Howard Mill understory burn project is approximately 7000 acres of burning within the Round Fire plantations. It is adjacent to the project area with several units falling within the project area. The Willow Creek thinning project is primarily a pre-commercial thinning and fuels reduction thinning within the Round Fire Plantations. The Horse Mountain Thinning project was a commercial thinning project to the South West of Pine Mountain. The Streeter Ridge thinning project was a precommercial thinning project that lies between Pine Mountain project and Horse Mountain project. The Westshore fuels reduction project is just north of the Pine Mountain project.

Direct and indirect effects of the proposed action are not considered adverse, from a vegetation management perspective, but rather beneficial in reducing excess stocking and fire risk. Stand conditions will be more consistent with what would be expected in a historical fire regime. Furthermore, there will be a higher likelihood of sustaining the wildlife habitat characteristics in the event of a wildfire. In addition, the proposed treatments will generally improve tree health, vigor and growth response effectuating resilience to insect and diseases. Thereby, reducing the potential for disturbance based mortality over all.

Cumulative effects for this project, including past, present and reasonably foreseeable future includes a net benefit overall for stand health and resilience to disturbance within the landscape area. . No adverse cumulative effects relating to vegetative resources are anticipated with implementation of Alternative 2. Implementation of Alternative 2 would help mitigate the overstocked condition resulting from past actions and fire suppression.

10.0 Alternative 3 No New Temporary Road Construction

10.1 Project Design Criteria and Mitigation Measures

This alternative would follow actions proposed in Alternative 2, with the exception of new temporary road construction.Alternative 3 analysis affects Units 13, 14 and 23.

10.2 Direct and Indirect Effects

Direct Effects:

Direct effects will be the same as Alternative 2 (the proposed action) with the exception of no new temporary road construction. (Construction distance one quarter of a mile.)Instead skid trails will be utilized to access these units. The alternatives replace road construction impacts with the direct effect from increased skid trail distance. The number of landings will be reduced causing a direct effect of increased slash pile size and slash quantities.

Concerning Units 13 and 14, the potential exists that a portion of the commercial treatment area would not be treated because of the longer skidding distances. Unit 23 skiding distances would also increase but to a lesser degree. Not as much of a factor as in Units 13 ansd14. If treatment does not occur because of lack of road construction, then less than 10” dbh thinning and prescribed fire treatment will be applied. However, this will not reduce tree density in the size of trees that make up a majority of these units. This will result in future >10” dbh trees continuing to

fall to the forest floor and greatly increase surface fuel loading. These units have a high density of small to mid-sized>10"dbh trees that over the last several years have been dying and accumulating as surface fuels. Refer toFigure 14. This effect will likely continue and the resulting fuel load will make for high fire intensity and higher mortality.

10.3 Cumulative Effects

Cumulative effects would remain the same as in Alternative 2 except that there exists a potential for a lesser cumulative reduction in potential wild life habitat enhancement and wildfire size as compared to Alternative 2

11.0 Alternative 4: No Thinning Above 10"Dbh in Riparian Reserves

This alternative would follow actions proposed in Alternative 2, with the exception of thinning above 10" DBH in riparian reserves.

11.1 Treatment Prescription 3 Existing Conditions,Direct and Indirect Effects Analysis

11.1.1 Existing Conditions of Riparian Reserves in Pine Mountain

An assessment was performed to address concerns that Riparian Reserves existing conditions may not represent a compelling need for commercial fuels risk reduction treatments. In order to bolster the initial field assessments made as units were originally selected for treatment, a study was designed to show that Riparian Reserves selected for commercial fuels risk reduction treatments are: (1) compositionally and structurally the same as adjacent Late-Successional Reserve and Matrix stands and (2) that the existing conditions of Riparian Reserves selected for commercial fuels risk reduction treatments would currently carry an active crown fire, and therefore represent a compelling need for risk-reduction treatment.

11.1.2 Effects Analysis Methods

There are many methods for determining whether or not a stand will carry an active crown fire. Some rely on the collection of numerous vegetative, terrain, and weather parameters and then using sophisticated models to simulate fire behavior, however canopy bulk density has been shown to be a strong surrogate for measuring crown fire susceptibility. Stands with a canopy bulk density greater than .1 kg/m^3 have been shown to be susceptible to sustaining active crown fire (Agee 1996, Cram et al. 2003). However, because canopy bulk density is difficult to measure, Keyes and O'Hara 2002 used relative density (percent of maximum SDI) as a proxy for crown fire susceptibility. Powell has taken that an additional step to convert Keyes and O'Hara's values to additional stand metrics including canopy cover, inter-tree spacing, trees per acre, and basal area (2010). For Douglas-fir stands the threshold for stands that will carry an active crown fire is a basal area of 135 square feet per acre of trees greater than 10 inches in diameter.

To analyze the effects of treating within the riparian reserves, the assessment consisted of three phases: (1) aerial photo comparison, (2) field data collection of basal area, and (3) field photo collection and comparison.

The first phase was measured by mapping Riparian Reserves within commercial fuels risk reduction treatment units. Using aerial photos from 2010, stands within Riparian Reserves were

compared with the surrounding commercial fuels risk reduction treatment unit. If the Riparian Reserve was noticeably less dense, or composed of a non-commercial species, it was classified as not the same as the surrounding commercial fuels risk reduction treatment. If however, the Riparian Reserve's composition and structure were of no noticeable difference, they were classified as the same. Areas classified as not needing treatment were later field verified.

The second and third phases were measured by sampling a subset of Riparian Reserves. The average basal area for the Riparian Reserve was measured and compared to reference values presented by Powell (2010). Photos were taken in each plot comparing the fuels from the inside of the Riparian Reserve to those of the adjacent Matrix and LSR treatment areas. To design the sample, Riparian Reserves were stratified by northern spotted owl habitat type. Since the majority of the habitat is foraging, foraging habitat areas were selected at random until approximately half of the acreage of Riparian Reserves were sampled. Sample plots were taken from a transect paralleling a randomly selected side of the stream course. Sampling locations along the transect were taken every 100 feet for Riparian Reserves less than approximately 500 feet in length, or every 200 feet for Riparian Reserves greater than 500 feet in length. At each sampling location, basal area was sampled using a 20 factor prism or angle gauge at a point 75 feet from the stream (halfway into the Riparian Reserve), and at a point 150 feet from the stream (the outside edge of the Riparian Reserve). Photos were taken at the location 150 feet from the stream pointing towards the Riparian Reserve and away from the Riparian Reserve. In total basal area was measured at 266 points (133 at 75 feet from the stream and 133 at 150 feet from the stream) along twenty-two transects.

11.1.3 Results Phase I

Phase one field verification results, confirmed that approximately 99 percent of the overall Riparian Reserve vegetative conditions are of the same composition and structure as adjacent Treatment Prescription 3 areas located beyond the riparian reserve boundary. Refer to Figure 18.

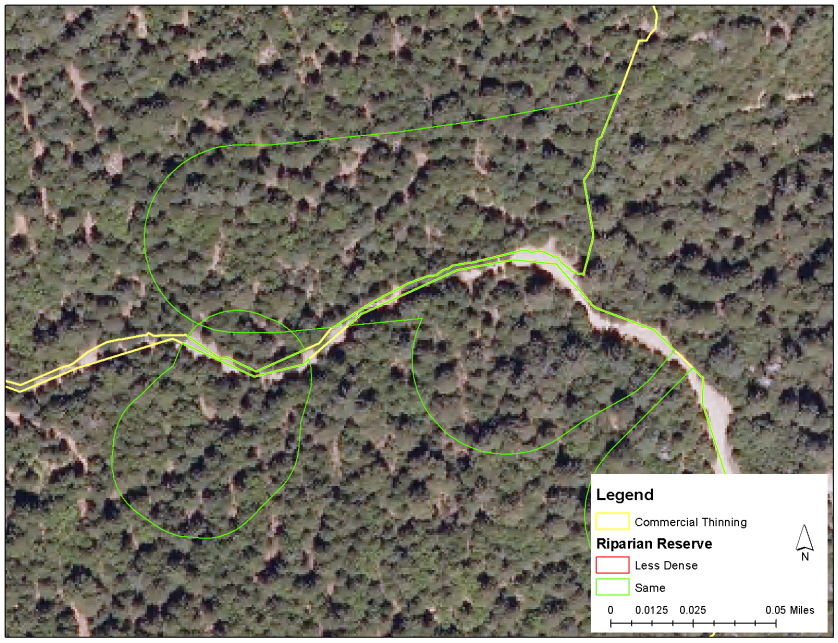


Figure 18Riparian Reserves similar composition and structure.

Only 1 percent of the overall Riparian Reserve area within commercial fuel risk reduction treatments were shown to have a lower density or to have a non-commercial composition during Phase one, Figure 19.

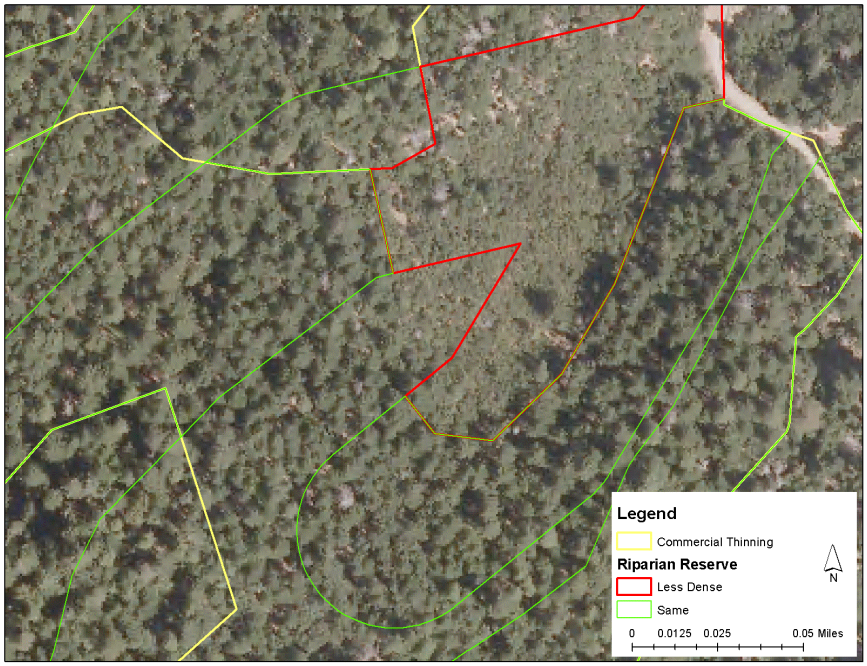


Figure 19:Riparian Reserves different composition and structure.

11.1.4 Results Phase II

On an individual Riparian Reserve basis, some portions of the sampled Riparian Reserves were below Powell's threshold for carrying active crown fire (135 square feet per acre of basal area for trees greater than 10 inches in diameter). For all twenty-two transects only two averaged below the threshold in the middle of the Riparian Reserve (at 75 feet), and five averaged below the threshold on the outside of the Riparian Reserve (at 150 feet), highlighted yellow in Table 39. One transect averaged below the threshold in both the middle and the outside of the Riparian Reserve.

Table 39: Results of sampling Riparian Reserves

Unit	Transect	Habitat Type	Points	BA Total	BA Greater 10	BA Total	BA Greater 10
				75 ft		150 ft	
8	1-26L	Foraging	10	150	104	190	144
8	27-2R	Foraging	6	223	173	193	127
12	28-3L	Foraging	4	220	190	230	180
7	31-6R	Foraging	6	260	210	297	270
6	4-?R	Foraging	3	207	180	167	153
16	7-33L	Foraging	9	244	169	218	178
16	8-34L	Foraging	6	207	130	183	93

Unit	Transect	Habitat Type	Points	BA Total	BA Greater 10	BA Total	BA Greater 10
				75 ft		150 ft	
15A	9-35L	Foraging	7	194	143	249	186
14	10-36R	Foraging	8	178	148	228	175
14	13-48R	Foraging	15	221	171	165	121
13A	14-39L	Foraging	5	196	152	212	188
13A	38-48L	Foraging	7	229	180	191	131
14	36-11R	Foraging	6	230	197	183	160
14	15-41L	Foraging	6	213	160	183	167
18	17-43R	Foraging	3	180	153	200	167
37	19-46	Foraging	6	243	213	250	220
37	20-45	Foraging	6	240	223	207	187
39	21-47	Foraging	4	175	145	230	200
24C	24-25	Foraging	3	160	140	180	140
24C	22-23	Foraging	3	233	160	247	193
18	18-44	Foraging	5	272	240	168	156
18	16-42	Foraging	6	228	204	152	132
			Overall Average	214	172	206	167

11.1.5 Results Phase III

Field observations and plot photo analysis substantiate that the units selected for commercial fuel reduction were chosen for their vegetative uniformity anda compelling need for risk reduction treatments.The historic treatments and the suppression of wildfire have similarly affected riparian areas and the adjacent upland treatment areas. The phase one and two assessment of stands confirmed that for the vast majority of Riparian Reserves, the pattern of disturbance (or lack there-of) that has affected stand development is the same across the landscape, both in Riparian Reserves and in the adjacent uplands. Comparison of photos taken as part of Phase III show little to no obligate riparian vegetation, or vegetation types. The photos are dominated with the upland vegetation types. Refer to Figures 20-26.

Figure 20 Near Watercourse Vegetation

Picture showing watercourse within riparian reserve. Note the larger Douglas-fir and sapling trees and live oak right down to the water's edge. Figure 20.

Figure 21: Canopy 75 Feet

Figure 22: Canopy 150 Feet

Pictures show canopy similarities at 75 and 150 feet, Figure 21 and 22.

Figure 23: Upslope Vegetation 75 Feet

Figure 24: Upslope Vegetation 150 Feet

Figure 25Upslope Vegetation 75 Feet

Figure 26: Upslope Vegetation 150 Feet

Pictures show upslope vegetation similarities at 75 and 150 feet Figures 23-26.

11.1.6 Direct and Indirect Effects

Referring to Table 39 above the overall pattern revealed by the phase two measurements is that on average, basal area sampled at 75 feet (in the middle of the Riparian Reserve) is no different than the basal area sampled at 150 feet (half in the Riparian Reserve and half in the adjacent upland areas), and both of these values exceed Powell's threshold for carrying an active crown fire, Table 39. The purpose of collecting data from the middle of the Riparian Reserve and at a point half in the Riparian Reserve and half in the adjacent upland area was to determine if there was a difference between the Riparian Reserves and adjacent upland areas. The lack of a difference between the two supports the conclusion that Riparian Reserves are no different, at least in regards to density.

Comparing alternative 2 to alternative 4 developed Table 40 below. This table displays stand density index values for the units used in the above analysis. Results indicated that stand densities will be reduced in all treatment units. However, Alternative 2 treatment effect is to move 11out of 12 treatment units SDI from extreme high density zone to the moderate density zone of Less than full site occupancy. The other treatment unitmoves from theextreme high density zone to the high density zone of Full site occupancy. Whereas, the effects of Alternative 4 three units remain within the zone of the zone of extreme high density where full site occupancy, severe competition between trees and active competition-induced mortality is occurring. 8 units move from theextreme high density zone to the high density zone of Full site occupancy, and these units fall

within upper range of zone which marks the threshold for the onset of density-related mortality. One unit falls within the zone of less than full site occupancy, the density being just slightly less than full site occupancy. One unit falls within upper range of the zone of less than full site occupancy with a density just under that required for full site occupancy. Refer to Table 34 Base Line Stand Density Index for color scheme information.

Table 40 SDI Comparison Alternative 2 to Alternative 4

Unit	Existing Condition	Post Harvest Alternative 2	Post Harvest Alternative 4
	2016	2018	2018
	SDI	SDI	SDI
6	436	153	256
7	746	162	298
8	548	163	225
12	756	144	284
13	433	173	206
14	493	151	280
15	456	205	316
16	701	148	402
18	486	151	301
24C	442	144	190
37	461	171	311
39	395	175	249

Conclusion:
Reviewing **Table 39** and **Table 40** the current stand structure represents high vegetation density for both the basal area indicator and stand density index indicator. As pointed out by Keyes and O'Hara's (2002), stand attributes play a critical role in crown fire susceptibility. The fuels specialist report points out that drainages and their corresponding riparian reserves are typically major fire paths for fires, and it is likely that fires will burn more intensely through the Riparian Reserves. Under this alternative, the Riparian reserves would see more canopy fire (torching and crowning) in most areas than if Alternative 2 were to be chosen. Under Alternative 4, the commercial stands would experience more torching and crown fires than under Alternative 2. The stands would also experience more areas with flame lengths greater than 4 feet than under alternative 2

In addition, studies have shown that accelerated development of many of the structural components of late-successional stands can be achieved (Oliver 1992, Marshall 1991) through reduced stand density that provide fewer small diameter trees and wider spacing between residual larger diameter trees an effect achieved by Alternative 2 and not by Alternative 4. The effect to late successional habitat is to provide the site condition to develop structural characteristics for late successional species.

Therefore, only treating trees less than or equal to 10 inches DBH (Alternative 4) will not meet the fuel reduction or habitat enhancement purpose and need.

11.1.7 Cumulative effects

Cumulative effects would remain the same as in Alternative 2 except that there would be less of a cumulative reduction in potential wildfire size as compared to Alternative 2, and increased densities have the potential to reduced habitat enchantment within riparian corridors.

12.0 Alternative 5 No Thinning Above 10”Dbh in NSO Nesting Habitat

This alternative would follow actions proposed in Alternative 2, with the exception of thinning above 10” in known NSO nesting habitat.

12.1 *Habitat Structural Analysis Trees Per Acre-Diameter Size Class, Stand Density Index,Basal Area, Canopy Cover, Quadratic Mean Diameter, and Trees Greater Than or Equal to 26 Inches DBH.*

Section 8.3.3 effects analysis will focus on habitat structural analysis comparing existing conditions to desired conditions. In addition, to LRMP and LSRA desired condition guidance direction was pursued from the USF&W concern NSO habitat desired condition. USF&W suggested following their directions to private timberland in California’s Northern Interior Region where the Pine Mountain Project is located. This document titled “Regulatory and Scientific Basis for U.S. Fish and Wildlife Service Guidance for Evaluation of Take for Northern Spotted Owls on Private Timberlands in California’s Northern Interior Region”(USF&W 2008) contains stand metrics needed to avoid habitat impact which would lead to NSO take situation. Table 9 in section 4.2 presents the minimum requirements for Take Avoidance. These habitat requirement will serve to guide NSO effectsanalysis. Additional stand metrics are also presented to clarify tree density distribution and species composition. Alternative Comparison shall employ the same standards.

12.1.1 USF&W Indicators

Treatment effects for Alternative 2 and Alternative 5 have been evaluated utilizing the following USF&W Indicators:Trees Greater Than or Equal to 26 Inches DBH per acre, Quadric Mean Diameter per acre, Total Basal Area per acre Indicator, and Percent Canopy Cover per Acre. In addition, Stand Density Index and Tree per Acre will be used.

12.1.2 Trees per Acre-DiameterSize Class Indicator:

Treatment effects for Alternative 2 and Alternative 5 have been evaluated utilizing the following diameter size classes: Total Existing Trees per Acre, Existing Trees per Acre Less than 10" DBH and Existing Trees per Acre Greater than 10" DBH compared to Post treatment values in each diameter size class.

Table 41: Trees per Acre Comparison Alternative 2 to Alternative 5

Unit	Unit Acres	Total Existing Trees per acre	Total post treatment Trees per acre	Existing Trees per Acre Less than 10" DBH	Total Post Treatment Trees per Acre Less than 10" DBH	Existing Trees per Acre Greater than 10" DBH	Post Treatment Trees per Acre Greater than 10" DBH
3A	12	241	83	159	17	82	66
Alt_5		241	110	159	29	82	80
19	20	144	77	60	0	84	77
Alt_5		144	93	60	10	84	83
24B	9	553	71	459	39	93	32
Alt_5		553	124	459	47	93	76
33B	18	820	175	721	80	98	95
Alt_5		820	126	721	40	98	86

Three of the four units Total post treatment Trees per acre, Total Post Treatment Trees per Acre Less than 10" DBH and Treatment Trees per Acre Greater than 10" DBH are greater for Alternative 5. Only Unit 33B is less.

Table 42: USF&W Indicator Comparison Alternative 2 to Alternative 5

Alternative 5	ACRES PER UNIT	Existing Condition	Post Harvest	Existing Condition	Post Harvest	Existing Condition	Post Harvest	Existing Condition	Post Harvest	Existing Condition	Post Harvest
		2016	2018	2016	2018	2016	2018	2016	2018	2016	2018
Unit	Acres	Total BA	Total BA	QMD	QMD	TPA ≥ 26	TPA ≥ 26	Canopy	Canopy	SDI	SDI
3A	12	215	202	13	20	17	18	68	65	357	208
Alt_5		215	218	13	19	17	18	68	67	357	243
19	20	279	254	19	25	34	34	67	60	398	310
Alt_5		279	263	19	23	34	34	67	62	398	332
24B	9	330	160	10	23	44	32	80	61	595	193
Alt_5		330	305	10	21	44	44	80	73	595	348
33B	18	219	201	7	15	12	13	81	71	462	162
Alt_5		219	179	7	16	12	13	81	66	462	201

Alternative 5 post treatment total basal area is greater in three of the four units with unit 33B having a lesser value.Alternative 2 post treatment QMD is greater in three of the four units with unit 33B having a lesser value. Post treatment tress greater than or equal to 26 inches DBH are the same except for Unit 24 B where Alternative 5 has a greater value. Alternative 5 post

treatment Canopy is greater in three of the four units with unit 33B having a lesser value.Alternative 5 post treatment stand density index is greater is all units.

Conclusion:
Reviewing **Table 41** and **Table 42** the current stand structure represents high vegetation density for all indicator with very little difference between treatments.

Because Alternative 2 can select trees form the understory and overstory Alternative 2 has advantage over alternative 5 in maintaining stand diversity and health. The removal of larger diameter trees around hardwoods and pine trees has been identifies as a concern related to species diversity. Since each alternative treatments effects are so close by the numbers, the advantage of the flexibility of Alternative 2 will help maintain presence of the late successional habitat for longer periods.

This advantage is consistent with studies that have shown that accelerated development, species diversityand maintenance of many structural components of late-successional stands can be achieved (Oliver 1992, Marshall 1991) through reduced stand density that provide fewer small diameter trees and wider spacing between residual larger diameter trees an effect achieved by Alternative 2 and not by Alternative 4. The effect of Alternative two to late successional habitat is to provide the site condition to develop structural characteristics for late successional species to a greater degree than Alternative 5.

References

This heading has a command built in to always put it on the next page—no page break is needed. Be sure that everything you cite in the text of your report has a corresponding citation here and that you have an electronic copy of each reference for your files. Do this as soon you cite it in your text so you (or the team leader) aren't scrambling to find the referencelater?

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Appendix